

ANNALS OF SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

EDITED BY
LEWIS STEPHEN PILCHER, M D, LL D,

OF NEW YORK,
Surgeon to the Methodist Episcopal Hospital,
and to the German Hospital in Brooklyn

WITH THE COLLABORATION OF

J WILLIAM WHITE, PH D, M D,	SIR WILLIAM MACEWEN, M D, LL D
OF PHILADELPHIA,	OF GLASGOW,
Professor of Surgery in the University of Pennsylvania	Professor of Surgery in the University of Glasgow

W WATSON CHEYNE, C B, F R S,
OF LONDON,
Professor of Surgery in King's College

VOLUME XXXIX
JANUARY—JUNE, 1904

PHILADELPHIA
J B LIPPINCOTT COMPANY

1904

CONTRIBUTORS TO VOLUME XXXIX.

ASHHURST, ASTLEY PASTON COOPER, M D, of Philadelphia

BALLOCH, EDWARD A, M D, of Washington, D C Assistant Professor of Surgery in Howard University, Surgeon to Freedmen's Hospital

BARNARD, HAROLD L, M S, F R C S, of London, Assistant Surgeon to the London Hospital

BEACH, H H A, M D, of Boston, Visiting Surgeon to the Massachusetts General Hospital

BECK, CARL, M D, of New York, Professor of Surgery in the New York Post-Graduate Medical School and Hospital, Visiting Surgeon to the St Mark's Hospital and the German Poliklinik

BICKHAM, WARREN STONE, M D, of New York

CHAPMAN, W LOUIS, M D, of Providence, R I

CHASE, HENRY MELVILLE, M D, of Boston

COBB, FARRAR, M D, of Boston, Surgeon to Out-Patients at the Massachusetts General Hospital

CUNNINGHAM, JOHN H, JR, M D, of Boston, Mass

CUSHING, HARVEY, M D, of Baltimore, Associate Professor of Surgery in the Johns Hopkins University

DAVIS, GWILYM G M D M R C S (ENG), of Philadelphia, Surgeon to the Episcopal, St Joseph's and Orthopædic Hospitals

DUDLEY, E C, M D, of Chicago, Professor of Gynæcology, Northwestern University Medical School

EASTMAN, JOSEPH RILUS, M D, of Indianapolis

EISENDRATH, DANIEL N, M D, of Chicago, Adjunct Professor of Surgery, College of Physicians and Surgeons, Attending Surgeon, Cook County Hospital

ELLIOT, JOHN WHEELOCK, M D, of Boston, Surgeon to the Massachusetts General Hospital

FREEMAN, LEONARD, M D, of Denver, Colorado

GALLAUDET, BERN B, M D, of New York, Surgeon to Bellevue Hospital, Demonstrator of Anatomy, Columbia University

GORDON, DONALD, JR, of New York

GRAY, FRANK D, M D, of Jersey City, Surgeon to Christ Hospital and Consulting Surgeon to the North Hudson Hospital

GRIFFITH, FREDERIC, M D, of New York

GWYER, FREDERICK, M D, of New York

HALL, J BASIL, M C (CANTAB), of Bradford, England, Honorary Surgeon to the Royal Infirmary

HALSTEAD, ALBERT EDWARD, M D, of Chicago, Professor of Surgery, Chicago Polyclinic, Attending Surgeon to the Cook County and St Luke's Hospitals

HARRIS, MALCOLM L, M D, of Chicago, Professor of Surgery in the Chicago Polyclinic

HAUBOLD, HERMAN ARTHUR, M D, of New York, Clinical Lecturer in Surgery and Demonstrator in Operative Surgery in the New York University and Bellevue Hospital Medical College, Surgeon to Harlem Hospital

HAWLEY, GEORGE W, M D, of Seattle, Washington

HOTCHKISS, LUCIUS W, M D, of New York City, Surgeon to the J Hood Wright Hospital, Assistant Surgeon to Bellevue Hospital

JOHNSON, ALEXANDER B, M D, of New York, Surgeon to the New York Hospital

KAMMERER, FREDERICK, M D, of New York, Professor of Clinical Surgery in Cornell Medical College, Surgeon to the German and St Francis's Hospitals

KEEN, WILLIAM W, M D, of Philadelphia, Professor of Surgery in the Jefferson Medical College

KEENAN, C B, M D, of Montreal, Assistant Surgeon, Royal Victoria Hospital

LYDSTON, G FRANK, M D, of Chicago, Professor of the Surgical Diseases of the Genito-Urinary Organs, Medical Department of the Illinois State University, Surgeon to St Mary's and Samaritan Hospitals

MACLAREN, ARCHIBALD, M D, of St Paul, Minnesota

MAYO, WILLIAM J, M D, of Rochester, Minnesota, Surgeon to St Mary's Hospital

MELLISH, ERNEST J, M D, of El Paso, Texas, Surgeon to Hôtel Dieu Hospital

MIXTER, SAMUEL J, M D, of Boston, Surgeon to the Massachusetts General Hospital

MOORE, JAMES E, M D, of Minneapolis, Professor of Clinical Surgery in the University of Minnesota

MOSCHCOWITZ, ALEXIS V, M D, of New York, Adjunct Attending Surgeon to the Mount Sinai Hospital

MOYNIHAN, B G A, M S, F R C S, of Leeds

MURRAY, FRANCIS W, M D, of New York, Surgeon to the New York Hospital

MURRAY, J W DRAPER, M D, of New York

PARK, ROSWELL, M D, of Buffalo, N Y, Professor of Surgery in the Medical Department of the University of Buffalo

REYNOLDS, HARRY B, M D, of San Francisco

RHOADS, THOMAS L, M D, Medical Department, United States Army

ROBERG, O THEODORE, M D, of Chicago, Illinois, Surgeon to the Swedish Covenant Hospital

ROGERS, JOHN, JR, M D, of New York, Surgeon to Gouverneur Hospital, Assistant Surgeon to St Francis's Hospital

ROME, ROBERT R, of Minneapolis, Minn, Professor of Gynæcology in the University of Minnesota

RUGBY, HUGH M, M S, F R C S, of London, Assistant Surgeon to the London Hospital

SARGENT, PERCY W G, MB, BC (CANTAB), FRCS (ENG), of London, Resident Assistant Surgeon, Late Surgical Registrar to St Thomas's Hospital

SCHWYZER, ARNOLD, MD, of St Paul, Minnesota

SHELDON, JOHN G, MD, of Telluride, Colorado, Surgeon in Charge of the Miners' Union Hospital

SIMPSON, F F, MD, of Pittsburg

SMITH, JOSEPH F, MD, of Chicago, Assistant Surgeon to the Presbyterian Hospital

SMITH, RICHARD R, MD, of Grand Rapids, Michigan

STONL, I S, MD, of Washington, D C

SUMMERS, JOHN EDWARD, JR, MD, of Omaha, Nebraska, Surgeon to Clarkson, Douglas County, and Wise Memorial Hospitals

TERRY, WALLACE I, MD, of San Francisco, Instructor of Surgery in the Medical Department of the University of California

THOMPSON, JAMES E, MB, BS, FRCS, (ENG), of Galveston, Texas, Professor of Surgery in the University of Texas

WATSON, FRANCIS S, MD, of Boston, Lecturer on Genito-Urinary Surgery in the Harvard Medical School, Junior Visiting Surgeon to the Boston City Hospital

WILCOX, SIDNEY F, M D, of New York, Professor of Clinical Surgery
in the New York Medical College and Hospital for Women

WINSLOW, KENELM, M D, of Seattle, Washington

WOOD, FRANCIS CARTER, M D, of New York, Instructor in Clinical
Pathology, College of Physicians and Surgeons, Columbia University,
Pathologist to St Luke's Hospital

ANNALS OF SURGERY

VOL XXXIX

JANUARY, 1904

No 1

ORIGINAL MEMOIRS.

ON REMOVAL, AFTER SUPRAPUBIC CYSTOTOMY, OF THE PROSTATE AND OF THE PROS- TATIC URETHRA FOR SENILE EN- LARGEMENT OF THE PROSTATE

WITH A LIST OF TWELVE CASES

BY B G A MOYNIHAN, M S, F R C S,
OF LEEDS

DURING the last two years I have operated upon a series of cases, twelve in number, of senile enlargement of the prostate, by removing the prostate and the prostatic urethra. The first operation of this kind was done on September 3, 1901. In this case, while shelling out the prostate from its capsule, I was conscious of the extreme ease with which the separation of the gland took place. When the enucleation was approaching completion at the posterior part, the last few movements of my finger resulted, suddenly and quite unexpectedly, in the whole gland becoming free and lying loose in the bladder. On removing and examining the gland I found that I had removed the prostate and the whole of the prostatic urethra as one complete whole. I was amazed at this, and not a little fearful as to what the ultimate issue of the case might prove to be. Within five weeks the suprapubic wound had completely healed, and the patient was, and still is, able to pass his urine

in a perfectly natural manner. There is not, nor has there ever been, any incontinence, nor any undue frequency, nor any disability. The method in this case was not one to be imitated deliberately until the event proved it to be wholly satisfactory. When I was assured that all was well with the patient I was emboldened to put the operation to a further proof, and this I have done in eleven subsequent cases. Two of the patients have been medical men. Of the twelve cases one has proved fatal. The ages of the patients have been fifty-nine, sixty-six, fifty-six, sixty, fifty-seven, sixty-six, sixty, seventy-three, seventy-two, sixty-five, seventy-three, and sixty-eight. In four of them a stone has been found and upon one of these patients a suprapubic operation had been performed for stone fourteen years before by Mr Berkeley Hill.

The operation is carried out in the following way.

The bladder is washed out thoroughly with a solution of carbolic acid, 1 per cent, and finally filled with ten or twelve ounces of this fluid. A rubber glove is worn on the right hand, so that after the rectal manipulations are over the removal of the glove may leave a clean hand with which to continue the operation. The bladder is now opened above the pubes and the left forefinger introduced. The lotion is allowed to escape from the bladder. It will be found that a better impression is gained of the nature and extent of the prostatic enlargement when the bladder is empty than when it is distended with fluid. The bladder wall at the incision is then seized on each side and a silkworm-gut suture is passed through the whole thickness of the abdominal wall and through the cut edge of the bladder, tied and left long. This fixing of the bladder to the wound prevents any undue tearing or stripping of the bladder by the subsequent manipulations. The sutures are allowed to remain for three days and are then cut away. By this time the bladder will be found fixed firmly to the hinder surface of the abdominal wall. With the left forefinger in the bladder, a snip is then made with a pair of sharp-pointed scissors into the mucous membrane of the trigone, immediately behind the internal meatus of the urethra. The tip of the

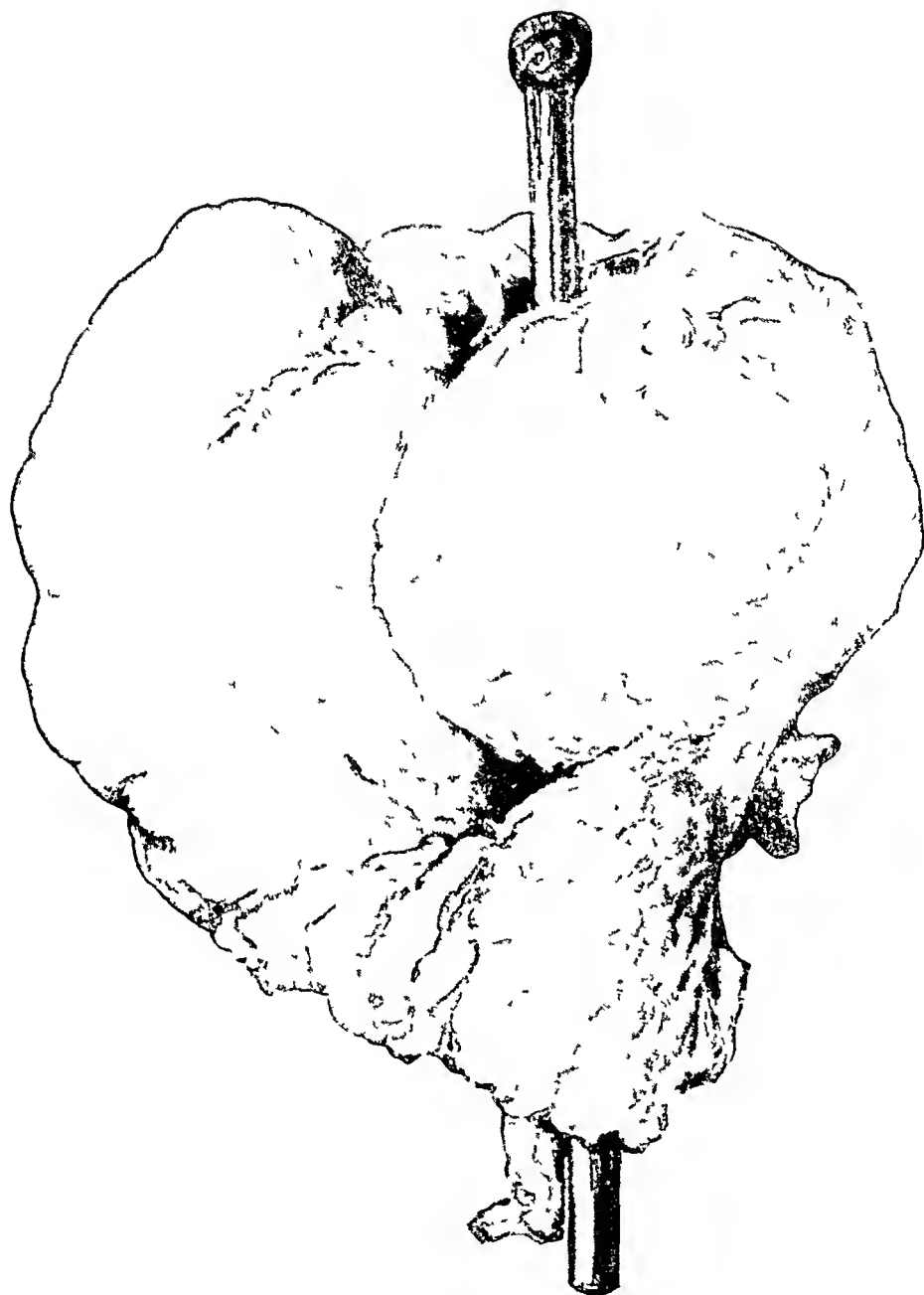


FIG 1—Drawing (actual size) of prostate removed in Case 8 Weight, six and one-half ounces



FIG. 2 — Transverse section of prostate removed in Case 1, showing the urethra

finger then deepens and gradually enlarges this small opening until the mucous membrane is felt to be loosened a little. Two fingers of the right (gloved) hand are then passed into the rectum and between these and the thumb pressed into the perineum, the prostate is firmly held while, with the left forefinger, the stripping of the prostate is commenced. This is generally very easily accomplished. The surface of the lobes is rapidly cleared, the opening in the mucous membrane is torn larger until it completely encircles the internal meatus, and, finally, the anterior portion of the prostatic urethra at its junction with the membranous portion is torn through after the prostate is elsewhere entirely free. The enucleation is easily and rapidly performed, as a rule, in from two to five minutes. The larger the prostate the easier the stripping. The fingers of the right hand are now removed from the rectum, the glove stripped off by an assistant, and a pair of vulsellum forceps passed into the bladder to seize and remove the loosened prostate. There is very little bleeding, as a rule, though in two instances there has been free hæmorrhage for twenty to thirty minutes. A catheter is now passed and the bladder freely flushed with hot sterile salt solution, or what is better, because of its anæsthetic effect, a 1 per cent solution of carbolic acid. When the fluid returns almost clear, a large rubber tube is passed into the bladder, and a couple of stitches introduced into the wound. After the prostate is completely removed, it is astonishing to find what a very small gap seems to be left in the base of the bladder. The interval so left is only about one-quarter the size that an inspection of the gland would lead one to expect. There are often extremely severe pains, paroxysmal in character, for a few hours after the operation, and the patient frequently complains of the insistent and compelling desire to pass water. A morphine suppository or a small hypodermic injection of morphine will give comparative ease, and in feeble old folk may safely and wisely be given.

At the end of forty-eight hours the tube is removed from the bladder, and the patient is allowed to sit up with the bed-rest. On the fourth day, and on each succeeding day, a cathe-

ter is passed, and the bladder is freely washed with dilute carbolic acid lotion. On the seventh day the catheter is tied in and a diag is placed upon the suprapubic wound. Every morning the diag is removed and the bladder again flushed, the catheter is not removed for five or six days, and a new one is then introduced. At each flushing of the bladder a few small sloughs can be picked away with dissecting forceps from the suprapubic wound. The catheter as it lies in the bladder may drain at once into a bottle, or a long fine drainage tube may be attached to the catheter, and lead into a bottle tied to the side of the bed.

If the patient be a feeble old man, it is advisable to vary this treatment by allowing him to get up and sit in a chair before the end of the first week. He may then be kept in bed with the catheter tied in on one day, and on the alternative days be allowed to sit up. The urine ceases to come through the wound about the end of the third week, and by the end of the fourth week, or occasionally not until the end of the fifth week, the patient is passing urine spontaneously, at natural intervals, without discomfort or difficulty, and the wound is entirely closed. If there has been cystitis, I generally order urotropine or helmitol to be given in ten to fifteen grain doses thrice or four times daily.

The question as to the priority in the method of enucleation of the prostate has been over-much discussed in the medical journals during the last few years. That Mr McGill and Mr Atkinson, of Leeds, employed enucleation there can be no question, but that all surgeons in Leeds and elsewhere temporarily abandoned the method, in their worship of false gods by the performance of castration and vasectomy, there can also be no doubt. To Mr Freyer belongs, at the least, the credit of calling us back to the rational surgical treatment of enlargement of the prostate. He claimed to be able to enucleate the whole of the prostate, leaving the urethra intact. Whether actually the whole of the prostate is removed in his operation, or whether a portion remains behind with the capsule or sheath is a matter of little more than academic interest. Certainly all

the prostate that matters is removed. He, and other surgeons as well, may be content to leave the question of priority to be determined by posterity. The method adopted by myself in this series of cases consists of the removal of the whole or of what may count as the whole prostate, with the prostatic urethra, in one mass.

The after-treatment of the cases requires considerable expenditure of time. The bladder is washed out daily with five or six pints of a 1 per cent solution of carbolic acid, and the wound is picked clean at each flushing. In two cases, where the cystitis was excessively severe and the urine most foul, after the bladder had been washed out, a stream of oxygen was passed through the catheter, and the bladder, as it were, washed out with oxygen. Over the suprapubic wound a tight-fitting impervious cap was placed, having a small leak to allow of the escape of the gas. In this way the healing of the wounds was certainly hastened.

Operations upon all patients suffering from the complications of senile enlargement of the prostate are necessarily serious. All the patients are over fifty-five, and all of them must have suffered in greater or less degree from some of the complications, retention, inability to pass urine, dependence, partial or complete, upon the catheter, cystitis, or hæmaturia before operation was recommended. It is, as a rule, only in the cases where catheter life is impossible or has ceased to be a relief that operation is advised. Many of the patients are broken in health from loss of sleep, loss of appetite, and constant anxiety as to their condition. They have all suffered the misery of catheterism. The patients are, therefore, almost without exception bad subjects for operation, but notwithstanding this, their recovery after operation is rapid and remarkable. It is, as Mr McGill used to urge, a serious matter to keep these old folks in bed. They should be allowed to sit up within two or three days of the operation, and they should be hedged round with every care and comfort.

SYNOPSIS OF TWELVE CASES OF PROSTATECTOMY

No	Date, Name, Age	History and Present Condition	Operation and Description	Result	Remarks
1	September 3, 1901 C Leeds Fifty-nine	Symptoms for three years retention Catheter passed frequently, but not as a routine procedure Bad cystitis, hæmaturia occasionally	Suprapubic prostatectomy Gland and urethra removed entire	R	Wound healed in fifth week
2	February 14, 1902 O Huddersfield Sixty-six	Symptoms for four years life, two years Cystitis	Suprapubic enucleation of prostate and urethra	R	Discharged with wound healed in eight weeks
3	November 19, 1902 Dr X Fifty-six	Symptoms for three years catheter life, five months Cystitis, wasting, great misery, and depression	Gland removed entire with about five-eighths of an inch of urethra	R	Wound healed in fifth week Was at work in ninth week
4	July 3, 1903 Y Sixty	Symptoms for about two years Partial catheter life Great frequency and distress Cystitis Acute orchitis resulted from catheterism	Gland removed entire It is not very much enlarged All the prostatic and about one-half inch of the membranous urethra came away	R	The wound did not heal till the fourteenth week When the catheter was tied in during the second week, an acute cystitis developed and suppuration occurred
5	July 3, 1903 Burley Fifty-seven	Difficulty from six to seven years Catheter life absolutely, three years Has very severe pain Rectal examination Moderately enlarged prostate	Prostate removed entire, the enlargement was limited almost entirely to one lobe There was also a small stone	R	Wound healed in fifth week

REMOVAL OF THE PROSTATE

7

6	July 8, 1903 Ilkley	R	Many years' history For eight weeks has been getting up every quarter- or half-hour in the night	Removed entire The enlargement only involves one lobe Three-quarters of an inch of urethra removed	R	Wound healed in seventh week
7	July 14, 1903 Leeds	T Sixty	Eight or nine months' difficulty Now always has to use catheter	Gland removed whole Uniform enlargement One and one-quarter inches of urethra removed	R	Wound healed in sixth week
8	August 13, 1903 M York Seventy-three		Suprapubic lithotomy fourteen years ago (Mr Berkeley Hill) Prostatic symptoms for ten years Complete catheter life for three years and nine months Cystitis and hæmaturia three months	Gland removed in one piece, with urethra Weight, six and one-half ounces Also, a very rough, large stone	R	Wound closed on fifteenth day
9	September 12, 1903 H G Hull Seventy-two		Catheter life, three years Worse lately, cannot rest at nights Very feeble, bad cystitis	Large gland removed entire with all the prostatic and one-half of an inch of membranous urethra	R	Wound healed on twenty-fifth day
10	September 24, 1903 J Scarbro' Sixty-five		Very feeble Symptoms for three or four years Catheter passed every one to two hours Has failed greatly in health, owing to loss of sleep and loss of appetite	Gland removed in six pieces, also a large stone	D	Not an enucleation similar to the others in this table Probably the right layer for stripping the capsule away was missed
11	October 2, 1903 S Thorne Seventy-three		Twelve months' catheter life Very severe pain before passing	Large gland removed entire One and one-half inch of urethra removed Large stone	R	Wound quite healed in three weeks
12	October 28, 1903 B Halifax Sixty-eight		Difficulty for four years Catheter, three years Cystitis, some bleeding	Removed entire One and three-quarters inches of urethra removed	R	Passed urine spontaneously on fourteenth day

INTESTINAL PERFORATION IN TYPHOID FEVER

BY RICHARD H HARTE, M D ,

AND

ASTLEY PASTON COOPER ASHHURST, M D ,

OF PHILADELPHIA

ALTHOUGH perforation of the intestines from ulceration has been recognized from early times, as may be seen in the occasional reports of autopsies,¹ yet it was not until about seventy years ago, when typhoid fever became clearly known as an individual disease, that many of these lesions were referred to it as a cause. And not until 1884 was surgical interference suggested as a forlorn hope in snatching a few of these patients from the jaws of death.

It was Leyden who first advocated laparotomy for this condition, and the first recorded operation was done by Mikulicz on April 7, 1884. The patient, a man aged forty years, was suddenly seized, while apparently in perfect health, with symptoms of intestinal perforation. After a lapse of seventy-two hours laparotomy was done through a median incision, and a perforation found and sutured. Pieces of potato were floating about in the man's belly. After a rather tedious convalescence, the patient ultimately recovered (*Volkmann's Samml klin Vorträge*, No 262, *Chirurgie*, April, 1884, No 83). It was an ambulatory form of the disease, the existence of typhoid fever being not apparently suspected before operation. This case has been rejected by some authors as not authentically one of typhoid fever, but it has been accepted by Dr Keen and by Dr Finney, among other writers on the subject, and a perusal of the original report leaves no doubt at all in our own minds as to the propriety of including it in the statistics of this operation.

{ For the first five years only ten of these operations are

recorded, and, indeed, a mortality of 90 per cent was not at all encouraging. But the sixteen cases subjected to operation during the second lustrum showed a death-rate of 87.5 per cent, while during the period from 1894 to 1898, inclusive, the mortality of the operation had been reduced to 72 per cent. This is probably still the death-rate, although of cases recorded since 1898 less than 70 per cent have terminated fatally, but no statistician, however enthusiastic, can afford to ignore those cases, mostly fatal, which are never reported at all, and must, therefore, allow a fairly wide margin in drawing conclusions from the figures available.

We have carefully examined in all the records of 362 patients, who, during the course of typhoid fever, submitted to laparotomy for intestinal perforation, or for peritonitis without actual perforation. From our tables we have excluded several cases where an operation was not performed until some time after recovery from typhoid fever, and also a very few cases accepted by previous writers on the subject, in which study of the original records has convinced us that the evidence did not warrant their inclusion. We have freely consulted the works of Keen, of Finney, of Hagopoff, of Miclescu, and of others, also the theses of Mauger, of Junqua, and of others, as well as numerous articles of less extent, among which mention may be made of those by Shattuck, Warren and Cobb, Bontecou, Munro, Monod and Vanverts, Briggs, Cushing, Abbe, Shepherd, Hays, and Hartmann, to all of which we desire to express our indebtedness. We have consulted the original reference in every case in which it was accessible to us, and in other instances have taken pains to indicate the medium of our knowledge.

Perforation of the intestines is said to occur in from 1 to 11 per cent of cases of typhoid fever. Leibermeister, in 2000 patients, found perforation in twenty-six, Murchison, in 1580 patients, observed it forty-eight times, Griesinger, in 118 noted fourteen perforations, while Flint, in seventy-three cases, found but two (these figures are from Hutchinson, in

Pepper's *System of Medicine by American Authors*, Philadelphia, 1885, Vol 1) Curschmann, in Nothnagel's *Encyclopædia*, Philadelphia, 1901, found that of 829 patients 27 per cent perforated. Armstrong, in the Montreal General Hospital (ANNALS OF SURGERY, November, 1902), observed among 932 patients an incidence of 3.66 per cent. At the Episcopal Hospital in this city we have examined the records since January 1, 1898, and find that, among 1556 patients treated for typhoid fever in that time, at least thirty-four perforations occurred, and at the Pennsylvania Hospital, among 1793 cases, forty-five perforations are recorded.

These figures may be compendiously seen in the annexed table

Authority	Cases	Perforations	Percentage	
Leibermelster	2000	26	1.3	7
Murchison	1580	48	3.03	
Griesinger	118	14	11.01	
Filnt	73	2	2.7	
Curschmann	829	22	2.7	1901
Montreal General Hospital	932	34	3.66	02
Episcopal Hospital	1556	34	2.18	
Pennsylvania Hospital	1793	45	2.5	1898
Total	8881	225	2.54	

CAUSES

The causes of perforation are numerous. As those predisposing to this lesion may be discussed race, sex, age, season, geographical location, stage of the disease, severity of the attack, intestinal parasites, etc. It may in general terms be said that the white race is more disposed to perforation than is the negro race, but sufficient statistics on this point have not been collected to enable us to speak with certainty. (The male sex is more liable to suffer perforation than the female in the ratio of about four to one. Of 279 cases in which the age is known, over 12 per cent occurred in patients under fifteen years of age, over 54 per cent between fifteen and thirty years, and only 33.6 per cent over thirty years of age. Season and geographical location have little influence in predisposing to per-

foration, although, of course, more perforations are apt to occur in the summer and autumn months in this latitude, because there are more cases of typhoid fever at these seasons. It would seem, also, that in warm and semitropical climates this complication is somewhat more unusual than in temperate and cold climates, at least, the majority of reported cases occurred in the United States, Great Britain, France, Germany, and the northern parts of Russia, although cases have occurred in Italy, in Constantinople, and other southern climates. In Mexico it is said to be very unusual.

Intestinal parasites may act as a predisposing cause, and even rarely as an exciting cause. Most of the earlier cases of perforation of the stomach reported were due to intestinal worms, and it seems not improbable that many cases of intestinal perforation reported during the last part of the eighteenth and early part of the nineteenth century as caused by worms were, in reality, in patients suffering from typhoid fever, the physician's attention at the autopsy being drawn away from the mucous surface of the intestines by both the parasites and the extensive peritonitis. Out of 932 cases of typhoid perforation reported as above stated by Armstrong, two had intestinal worms. We have not ourselves observed this complication.

✓ *Stage of Disease*—Out of 286 cases in which is known the stage of disease at which perforation occurred, only six, or about 2 per cent, took place in the first week. The second and third weeks witnessed 162 perforations, or 56.6 per cent of the whole number, while after the end of the third week only 41.2 per cent occurred!

Severity of Disease—It has been stated that perforation is more apt to occur in the mild than in the aggravated form of the disease. Dr. George B. Wood² expressed himself of this opinion, Curschmann says perforation is more frequent in ambulatory and mild cases, also among the lower classes, for the same reason, namely, lack of proper care,³ and Osler says, "There is certainly no relation between this accident

and the severity of the disease" ⁴ But, on the other hand, Hutchinson ⁵ claims that in a large proportion of cases it occurs in grave cases, and Osler himself, in a later utterance, ⁶ reverses his opinion by stating that perforation usually occurs in the more severe cases. This is a point which it is difficult to determine, because many ambulatory cases would never be seen in hospitals at all, unless perforation had occurred, and because, when perforation does occur in very severe cases, it is often extremely difficult to diagnose on account of the apathy or hebetude of the patient, and it thus not infrequently happens that a perforation is unexpectedly found at autopsy, when it had been thought that the patient had died merely from the toxæmia incident to a prolonged course of the disease. Moreover, we recollect in after years chiefly those cases where the perforation comes contrary to all expectations, while those patients in whom its advent is hourly anticipated do not create so lasting an impression on our minds. We are, therefore, of the opinion that, although perforation certainly does occur most unexpectedly in some patients, and although in patients who have already reached the stage of convalescence, and in those suffering from an ambulatory form of the disease, its occurrence has frequently been observed, yet that in the majority of instances it is a lesion of the severer forms of the disease, and that it is in these cases that preventive measures, such as they are, should be employed. In connection with the severity of the disease, the existence of *tympany* as a predisposing cause of perforation may be considered. Where ulceration of the bowels is extensive and tympany coexists, there is every reason to believe that perforation is more apt to be produced by mechanical causes, such as a sudden turn in the bed, etc., than in cases where the intestines are comparatively flaccid. The condition of the intestinal walls themselves is, of course, of importance as a predisposing cause. Attention has recently been called to the action of the thrombi so frequently observed beneath the serous coat of the bowels in typhoid fever, and it has been asserted ⁷ that they act as a factor favoring the occur-

rence of peritonitis without perforation, and, it seems reasonable to infer, also in predisposing to perforation

EXCITING CAUSES—The exciting causes are chiefly those which act mechanically. Anything, in fact, which sets up unusual peristaltic action is liable to cause a solution of continuity in the already damaged intestines, among these, indiscretions in diet probably hold first place, then purges injudiciously administered, a large or too forceful an enema, a sudden motion in the bed, straining on the bed-pan, the almost involuntary contraction of the abdominal muscles produced by the physical shock of the cold bath, each one of these and others have been held responsible for the immediate onset of symptoms of perforation

PATHOLOGY

The lesions of the intestine in typhoid fever consist, as is well known, mainly of changes in the lymphoid tissue found in greatest abundance in the lower part of the ileum. In the first week or ten days of the disease the intestinal lymph nodes are swollen, Peyer's patches being, as a rule, affected earlier than the solitary glands. This swelling consists, as has recently been shown by Mallory,⁸ of Boston, chiefly in a proliferation of the endothelial cells of the lymph and blood-vessels, these endothelial cells show a marked tendency to gorge themselves with lymph cells (lymphocytes), thus constituting the pathognomonic "typhoid cells." It is to be observed that a large number of polymorphonuclear leucocytes does not collect until either a mixed infection has arisen or until the typhoid germs have taken on pyogenetic properties, so that in the early stages of the disease there is not usually an appreciable amount of "round-celled infiltration." If this medullary infiltration, as it is called, above described, does not resolve, the affected area is thrown off into the lumen of the bowel by a process of coagulation necrosis. This process is aided partly by the mechanical ischæmia produced by the choking of the vascular channels, and partly by the direct action of the typhoid toxins

These toxins, spoken of rather vaguely in the past, have taken on a new significance from recent studies⁹ which apparently show that they are the agents producing the agglutination thrombosis of the erythrocytes in typhoid fever. This thrombosis, as well as the ordinary form of thrombosis (produced when the engorged endothelial cells degenerate and induce a precipitation of fibrin,—a coagulation necrosis), predisposes to the sloughing, which is either molecular or massive. The surface left by the slough forms the ordinary typhoid ulcer, the floor of which, in the large majority of cases, is formed by the muscularis mucosæ.

Now, if this medullary infiltration has involved the whole thickness of the intestinal wall, when the slough is cast, naturally, a perforation of the bowel results. Accordingly, we find that perforations occurring at this stage of the disease are rarely of the pin-point size so frequently observed at a later date. The reports we have examined are not, most of them, circumstantial enough to enable us to derive any authoritative statistics with regard to the relation of the size of the lesion to the stage of the disease at which perforation occurred, but there can be little doubt that, as a rule, the large perforations occur early in the course of the fever.

If, on the other hand, the slough cast off is slight in depth, the resulting ulcer usually heals. The sloughs are usually separated about the end of the second or the beginning of the third week.

When the ulcer fails to heal and gradually deepens, as it approaches the peritoneal coat a slight degree of plastic peritonitis may be set up, the serous coat becomes congested, slight effusion ensues, a patch of lymph is formed on the serous surface, and, in favorable cases, the bowel becomes attached to a neighboring coil or to some part of the parietal peritoneum. This is Nature's method of healing a perforation. A specimen illustrating this process is in the Museum of the Pennsylvania Hospital. A tag of omentum has, in some cases, been found at operation attached feebly to the perforated area.

If the process be not arrested at this point, an abscess will form, and cases have been reported in which such an abscess was not opened for two or three months subsequently, the patients ultimately recovering¹⁰ If, however, no adhesions form, then perforation into the free peritoneal cavity takes place, and general peritonitis results Even in cases of perforation arising after this manner, the size of the bowel opening may be great, or several small perforations may form in the floor of the same ulcer At times it almost seems as if the stage of medullary infiltration persisted throughout the disease, since in cases of perforation from ulceration the surrounding parts of the perforated Peyer's patch sometimes are so thickened and friable that it becomes impossible to make sutures hold, whereas at other times the bowel has become so thinned by extensive ulcers that it appears like paper At times, too, it is impossible to tell whether the perforation has arisen from sloughing or from progressive ulceration

Much has been written about a preperforative stage, and there can be no question but that there is always a time previous to perforation, but we very much doubt whether it can be recognized as a pathological any more than as a clinical entity, because so often there may be a certain degree (and at times a very marked one, too) of peritonitis without any macroscopic evidence of perforation

As to the form of the perforation, the larger circular lesions are, as has been stated above, generally due to sloughing, the smaller, or cribriform, to ulceration, and the oblong, slit-like perforations have been thought to be due to traumatism

✓ The perforation is usually situated on the part of the bowel diametrically opposite to the mesenteric attachment, where the lymph glands of the intestine are found and where the blood supply is poorest Occasionally, however, an ulcer will perforate between the layers of the mesentery, and a retroperitoneal abscess will be formed Such a lesion may be mistaken for a suppurating mesenteric gland

The perforation is fortunately single, as a rule, in 271

cases in which this point is mentioned, a single perforation occurred in 236, while in the remaining thirty-five it was multiple. In seventy-two cases the perforation was less than one-eighth of an inch in diameter,—practically pin-head in size, in seventy-three cases it was under one-half an inch, and in only twenty-three cases was it over a half-inch in diameter,—there being only 168 cases in which the size of the perforation was mentioned.)

(The site is mentioned in 190 cases, and in 140, or over 73 per cent, of these the lesion was found within twelve inches of the cæcum, and in only four cases, or 2.1 per cent, was it more than three feet distant from the ileocæcal valve. In seven cases only was the colon perforated, five times the ascending colon, once each the transverse colon and the sigmoid flexure. Meckel's diverticulum was perforated three times, and the appendix eight times. It is to be noted that we have carefully excluded from this series every case of perforated appendix in which the lesion has not undoubtedly been proved to be of typhoid origin, even rejecting, as of doubtful value, some such cases previously accepted by other authors. There were twelve patients in whom a subsequent perforation occurred. These all died. In three cases, while one or more perforations were found at operation, yet others in the same patients were not detected,—these all likewise perished.)

At times the perforation is only to be seen after a patch of lymph has been removed from the bowel, the perforation then appearing as a dark spot in the centre of an intensely congested area, at times nearly sphacelated and falling away beneath the fingers.

There was not a sufficient number of cases reported in detail to enable us to determine in what proportion or after what lapse of time adhesions would be found, but, generally speaking, it may be said that adhesions are the exception, that they are usually indicative of a mixed infection, and that, except in cases of several days' standing, they are of unfavorable prognostic import. With regard to the bacteriology, it has been found that in cases where the typhoid bacillus alone

is the infecting cause, the usual lesions are a low-grade peritonitis, frequently lemon-colored exudation, few adhesions, and not much lymph. Where the streptococci or the staphylococci abound the lymph is more abundant, and adhesions are the rule if the peritonitis has lasted more than a few hours. The prognosis is much more grave in the streptococcic infection than in the typhoid. An interesting case in this connection was observed at the Johns Hopkins Hospital. At the first operation on a patient suffering from typhoid perforation bacteriological examination of the peritoneum showed no organisms, while the intestinal contents contained streptococci in abundance, this patient was later subjected to a second laparotomy, at which time the peritoneum was found to be infected by the streptococci, and death soon followed from the peritonitis.¹¹ Evidently in this case the time which elapsed between the initial symptoms of perforation and the operation—five and a half hours—was not sufficient to infect the peritoneum extensively with intestinal contents, whereas forty-three hours later, when the second operation was performed, general purulent peritonitis was well advanced.

SYMPTOMS

In what may be called a typical case, the symptoms are well marked and easily distinguished, but, unfortunately, such a case is the exception. It is well known, moreover, both that a patient who has presented all the clinical evidences of a perforation may submit to laparotomy, and no perforation nor even a trace of peritonitis be found, and that, on the other hand, patients may die without any abdominal symptoms of importance, and at autopsy a perforation may be found, to every one's complete surprise.

But there are undoubtedly certain symptoms which should at once throw the attending physician on his guard, and which should make him disposed to consult one with surgical acumen, even before he is sure a perforation exists. A patient in the second or third week of the disease, who at various times has had slight or more severe stabbing pains in the abdomen,

whose abdomen is much distended and tympanitic, who, perhaps, is somewhat apathetic, who is apt to have retention of urine, and has perhaps lost control of his faecal evacuations,—such a patient should be watched hourly. Any one of these slight stabbing pains may be significant of perforation, and, although pain alone is by no means pathognomonic, it is by all means the most valuable subjective symptom.

Pain —The pain is, as described, usually a stabbing sensation, most frequently in the right lower quadrant of the abdomen, though for it to be felt in the epigastric or the umbilical regions is also customary, and a not unusual situation is in the bladder or, in the male, at the end of the penis¹². Cases have occurred in which, on such complaint from a ward patient, the orderly has been allowed to use the catheter, drawing perhaps a couple of ounces of urine, and the patient, not again complaining, has been neglected, until in a few hours a fatal peritonitis has developed. But the pain may not cease so readily, and the patients at times will scream out and roll around the bed in an agony, doubling themselves up with abdominal pain, which may persist for two or three hours with undiminished intensity. Again, as has been mentioned, in a very apathetic patient no pain at all may be felt, or, at least, none be complained of. Or, on the contrary, there may be only a gradually increasing discomfort in the abdomen, with no sudden sharp onset of pain. This is more usual where the abdomen is already tympanitic and where peristalsis has been for some time very slight.

Vomiting occurs so frequently in severe cases of typhoid fever with no apparent exciting cause that it cannot alone be considered at all indicative of perforation, but where it occurs for the first time, and especially where it either precedes or follows pain, it should not be passed lightly by. If it is at all violent it will very likely cause a perforation, and in very many instances follows it.

Temperature, etc —At the same time as the pain, or soon after, sweating may occur, it has even been known to precede the pain, which has always been supposed to be indicative of

the moment of perforation. With the sweat, or when sweating is absent, occurs a fall of temperature—a drop of four to six degrees is not infrequent. It has been claimed that this fall of temperature—this *hypothermie*—is not at all constant, and the dictum of Dieulafoy, “No perforation without fall of temperature,” has been called in question by some authors, notably by his countryman, Lereboullet, who maintains, on the contrary, that a rise of temperature invariably follows perforation. Hagopoff tries to reconcile these statements by claiming, and, we think, not without reason on his side, that where no “hypothermie” has been observed it is simply because the temperature was not taken sufficiently soon after the perforation occurred, but at a time later, when the temperature of the patient had risen as a result of the subsequent peritonitis, this explanation really upholding the views of Dieulafoy. Lereboullet’s contention certainly cannot be true in all cases, since sometimes the patient is so collapsed as a result of the perforation that the ensuing peritonitis, even if he live long enough for it to commence, is not sufficient to raise his temperature to the normal, but he dies in collapse.

Very confusing in this connection are those cases in which several falls of temperature have occurred within a day or so of the suspected perforation. Fall of temperature is, of course, a frequent accompaniment of intestinal hæmorrhage during typhoid fever, and, either as a result of that, or even with no ascertainable cause, the patient may for several days, perhaps merely from general loss of vascular tone, have suffered at irregular intervals from sweats and sudden falls of temperature. So that neither of these symptoms, any more than abdominal pain, is to be regarded as pathognomonic of perforation.

Frequently a change in the solubility of the *bowels* follows perforation. Were they loose before, they become confined, or were they costive previously, this condition is replaced by diarrhœa.

Delirium may have pre-existed, or may develop only with the peritonitis.

Leaving now the subjective symptoms, we come to the physical signs, on which more reliance is to be placed, and of these by all means the most valuable is rigidity of the abdominal walls

✓ *Rigidity* —By this we mean, not that rigidity which the physician may any day produce by thrusting his fingers into the patient's belly so as to feel the backbone, but the well-known rigidity ensuing on peritoneal inflammation, and which is involuntary, reflex, not produced by palpation. This muscular rigidity is most frequently observed in the right rectus muscle, also in the right oblique muscles and in the left rectus, in time spreading with the peritoneal inflammation all over the abdomen. A surgeon's rigidity and a physician's rigidity are two vastly different things, and the distinction is well worth remembering. The rigidity of pleural irritation is sometimes mistaken for peritoneal involvement, or *vice versa*. In one of our own cases operation was delayed because of evidences of a pulmonary lesion, whereas perforation was really present, as was sadly manifested by the peritonitis which developed a few hours later, and the operation performed then was too late.

✓ *Pulse and Respiration* —Along with these cardinal symptoms—pain and rigidity—there is, in the vast majority of cases, an increase in the pulse-rate. In most cases of typhoid fever the pulse is slow in relation to the height of the fever, rarely averaging more than 100 beats per minute, but after perforation the rate rises to 120 or 140 in a very short time, often within fifteen or twenty minutes, and the respirations may be accelerated as well. Not until peritonitis is well advanced does purely costal breathing replace the costo-abdominal, which is the normal, and patients who are at all conscious alter the character of their respirations so readily during examination that too much reliance should not be placed on this sign.

✓ *The facial expression* is important. Almost from the very moment of perforation there is a distinct change of expression, difficult to describe, yet easily recognized when once seen. It is not the peritonitic facies, which closely approaches the Hip-

pocratic in type, but is distinctly characteristic of the shock of perforation. It is what the French might call an "abattement" of the countenance, consisting in a general weakening of the expression.

Tenderness, while often present throughout the disease, is probably, without exception, increased by a perforation. In appendicitis it may persist when, the appendix having become gangrenous, rigidity has disappeared, but we are of the opinion that in intestinal perforation rigidity is the more valuable sign of the two, for, as has been mentioned above, in the apathetic state to which typhoid patients often attain, tenderness sometimes cannot be elicited. When present, it is usually found in the right lower quadrant, near the customary site of the lesion.

Dulness to percussion is a very uncertain sign. It may exist from a fecal accumulation, and be mistaken for the matting together of intestines from peritoneal inflammation. Even movable dulness in the flanks may be caused by fluid feces within the intestinal tract, when there is no suspicion of perforation. But if well-marked movable dulness in the flanks develops in the course of an hour, as we have seen it do, it presents very excellent evidence of a solution of continuity in the intestinal walls, as it is scarcely conceivable either that fluid feces within the bowels should at one time produce no such signs, yet within an hour later do so, or that an amount of exudation sufficient to give movable dulness could be formed by the peritoneum in so short a space of time. But, on the other hand, the absence of this free peritoneal fluid should, on no account, be taken as showing that neither perforation nor peritonitis existed.

The same remarks apply to obliteration of the liver-dulness as to movable dulness in the flanks, it may occur merely from tympany, without perforation, and even with perforation and with air free in the peritoneal cavity, the dulness over the liver may persist. However, they are both interesting signs, and it is well to note their presence or absence.

Edema of the abdominal walls is occasionally observed

in this as in other intra-abdominal lesions, but has no specific significance

BLOOD—The condition of the blood is one of the most vexed questions that arises in this connection. It has been much more extensively studied by American than by English or Continental observers (Osler says that a steadily rising leucocyte count is indicative of perforation, for such an observation the white blood-cells should be counted every half-hour or hour during the period of uncertainty) Few hospitals, and no one in private practice, can afford to have this done, even the routine work in most institutions consuming the whole time of the clinical pathologist. In most cases where, in the course of twelve or eighteen hours, three or four examinations at the outside are made, the majority of advocates of the benefits conferred by blood examination claim that such erratic observations are of no use. The average surgeon is averse to having his diagnosis made for him in the laboratory, and will not hesitate to follow his own judgment, in the face of overwhelming contraindications from the microscopist's standpoint.

A wave of leucocytosis has been described, reaching its maximum soon after perforation, and then again subsiding. Differential counts have been claimed to be more reliable than a mere enumeration of the white cells as a whole, inasmuch as in commencing peritonitis there is a disproportionate increase in the polynuclear neutrophiles.

In drawing conclusions from any leucocyte count in typhoid fever, the normal leucopenia of this disease should be borne in mind.

This whole question is as yet undecided, the accurate observations being still too few to draw any very definite conclusions.

DIFFERENTIAL DIAGNOSIS

A differential diagnosis has most often to be made from hæmorrhage. While the collapse is very likely the same in either case, yet hæmorrhage is, as a rule, not attended by pain, and there is no rigidity present, in hæmorrhage the blood is

generally passed by the bowel in the course of an hour or so at the outside, and in most cases where confusion is liable to arise, the occurrence of previous hæmorrhages in the same patient would incline one to pause before undertaking an exploratory laparotomy. Osler and others have reported series of cases in which attention is called to the frequent association of hæmorrhage with perforation, and in any case where reaction from the collapse, due to an obscure abdominal lesion, does not occur promptly, we are in favor of operative treatment, since in one of our own cases the bleeding point has been found by laparotomy and ligated.

The diagnosis from peritonitis without perforation is immaterial, as operation is indicated in both conditions.

From appendicitis the diagnosis can best be made by recollecting that in appendicitis there is rarely such collapse as occurs from perforation of the small or large intestine, even if the appendix be perforated. Vomiting is more apt to have occurred with the initial pain in appendicitis than in perforation. Moreover, vomiting may cause perforation, while it could scarcely alone produce appendicitis. Symptoms resembling those of appendicitis are not unusual at the beginning of an attack of typhoid fever, and in a number of cases the appendix has been removed under such circumstances with happy results. The differential diagnosis here, too, is not especially important, as the removal of the appendix for disease is indicated in typhoid fever as well as at any other time.

From peritonitis due to pelvic or ovarian disease the diagnosis can usually be satisfactorily made by attention to the history of the case, together with a vaginal examination.

We have seen intussusception occurring during an attack of ambulatory typhoid fever, but, as the peritonitis was already well advanced, no question of differential diagnosis arose.

Affections of the gall-bladder occurring during typhoid fever from infection by the typhoid bacillus are not uncommon, they present pain in the right hypochondriac region, sometimes jaundice, vomiting is more persistent, no fall of temperature occurs, there is little shock, and the physical

signs—tenderness, rigidity, dulness, palpable mass—aid in the localization of the disease

Gastric ulcers may perforate during typhoid fever the localizing signs here, too, are our chief guide

Finally, suppurating mesenteric glands, or splenic infarcts, may give rise to peritonitis in this disease, but here the symptoms are those of peritonitis pure and simple, there are none of those characteristic of intestinal perforation

PROGNOSIS

It may be confidently said that of those patients who die after an operation, in very few, indeed, has the operation hastened death. Even in those cases which end unfavorably, it is usually observed that the patients have left the operating-table in better shape than that in which they were brought to it so much is gained by intravenous saline injections, by vigorous hypodermatic stimulation, and frequently by the free douching of the abdominal cavity with hot saline solutions

Only five of the patients operated on are known to have died before the conclusion of the operation. Of those that died, twenty-one lived two days, twenty-three lived three days, twenty-one lived five days, seven lived nearly a week, while eleven lived over a week, three over two weeks, and four over a month, certainly in these last eighteen cases the patients may be said to have recovered from the operation

Of the whole number, 26 per cent finally left the surgeon's hands well. A small proportion of these, to be sure, might look forward to an intestinal obstruction arising at any time of indiscretion in diet, if they had been the subjects of extensive peritoneal adhesions, some, furthermore, when last reported had still a fæcal fistula in the wound, and probably a considerably larger number had or would soon develop a ventral hernia, but taking them all in all, they had reason to be thankful to have escaped a typhoid perforation with their lives

The extensive analytical tables attached show in compact form the mortality rate considered from very various points

of view Briefly stated here, the most favorable cases have been those in girls from ten to fifteen years of age, the perforation occurring in the first week of the disease, when the constitution is still strong, or in convalescence, when the frame is already re-established, who have been operated on in the third hour after perforation, the single perforation being pin-head in size (under one-eighth of an inch in diameter), within a few inches of the cæcum, or in the appendix, and where neither fecal extravasation had occurred nor adhesions were present Such would be ideal cases, and the mortality should be less than 50 per cent

TREATMENT

The treatment of all patients suffering from intestinal perforation in typhoid fever should be by laparotomy and suture of the perforation, to trust to medical treatment alone is nothing short of folly Some cases may be thought an exception to this rule those patients who are manifestly moribund should be given the benefit of doubt, and if, under vigorous stimulation, any improvement is noted, or even if they cease to grow worse, the surgeon should not hesitate to interfere } The average time consumed in the operation by skilful operators is about fifteen or twenty minutes Nor should it be forgotten that ether is a heart stimulant, and if the pulse improves under its administration operation is surely justified We believe that well-authenticated cases of recovery from intestinal perforation without operation are excessively rare, indeed, since it has happened with every symptom of perforation present, and the abdominal cavity having been opened and explored, that no signs of perforation, much less of peritonitis, have been found, it may be considered proved that the examples of so-called recovery from perforation without operation are cases of this nature, and that while the symptoms of perforation and of peritonitis may have been present, yet such lesions did not exist Even in cases, almost unknown as they are, where the patients have survived the immediate effects of the perforative peritonitis, yet, even many months subse-

quently, they have submitted to laparotomy for an abdominal abscess of apparently obscure origin, but evidently arising from the former peritonitis—the condition being, in fact, one of residual abscess. Hagopoff, seemingly a careful observer, accepted as genuine instances of recovery without operation only fourteen cases, rejecting those observed by Griesinger, which are recorded in the thesis of Morin. When it is recollected that, according to the calculations of Briggs,¹³ more than 16,000 perforations of the intestine due to typhoid fever occur annually in the United States alone, the exceeding rarity of recovery without operation is appreciated by realization of the fact that for all time, and all over the world, only fourteen cases are known which have so terminated.

From the moment of diagnosis until the time of the operation little is to be done in the way of treatment except by stimulation, hypodermatically, or with intravenous saline injections. To avoid the delay sometimes occasioned to obtain consent of the family to an operation, it is well to arrange such questions, in every possible case threatening perforation, even before the diagnosis is made—the less time that elapses between diagnosis and operation the better for the patient.

Anæsthetic—As to the danger of a general anæsthetic in such patients as these, we believe that while some operators may have the faculty of so hypnotizing their patients as to make local anæsthesia available, yet the average surgeon will succeed better by the use of ether judiciously administered. In other climates, and in higher altitudes, we have no doubt that with care chloroform can be safely employed, but certainly in the middle and northern parts of the United States nothing is so satisfactory as ether. We are, moreover, of the opinion that a general anæsthetic will, in the average patient, tend to diminish shock, although we freely admit that the abolition of all afferent impulses produced by the cocainization of sensory nerves will theoretically render impossible the physical conditions now believed to be necessary for the production of surgical shock. But mental perturbation is at least an equally disquieting element for the surgeon to deal with, and

this is in no respect diminished, but rather augmented by the consciousness on the patient's part of the details of the surgical procedures

Most of the patients with perforation seen by us have been already in such a state of prostration that only a few whiffs of the anæsthetic have been required to completely anæsthetize them, as well as to render them unconscious and to relax their abdominal muscles, a state which is not attained by the use of a purely local anæsthetic

In the majority of cases where the operation has been commenced with a local anæsthetic, it has been found expedient to resort to the use of ether or chloroform soon after opening the peritoneal cavity, and often fifteen or twenty minutes have been consumed in making the incision through the abdominal parietes alone, the patient meanwhile complaining bitterly. This state of affairs, we should add, has not always been the case, for some surgeons have had most gratifying results from local anæsthesia in operations of this kind

When anæsthetization is begun (and this should not commonly be done until the patient is on the operating-table), the abdomen should be shaved, including the pubic hair, and cleansed. We prefer for this purpose turpentine, followed by green soap and water and then by alcohol, the whole area is then thoroughly rinsed off with corrosive sublimate (1 to 2000) and covered with a cloth wrung out of this solution until the surgeon, who has meantime been cleansing his hands, is ready to operate. The three processes—anæsthetization, cleansing of the abdomen, and washing of the surgeon's hands are commonly completed at about the same time, so that everything is coincidentally ready for operation. It is convenient for the surgeon to have two assistants as well as three nurses at his service—one nurse to hand instruments, thread needles, etc., a second to attend to the gauze sponges, and a third to bring hot salt solution, etc., as wanted. There should, likewise, be a fourth nurse at the call of the anæsthetizer to administer hypodermatic injections, tend the oxygen apparatus, and similar duties. Where facilities abound, a third assistant for

the surgeon and a fifth nurse can frequently be advantageously employed in giving an intravenous injection of hot normal salt solution, seldom more than three pints are necessary, often two is an abundant quantity. By recommending all this array of assistants as convenient, we do not by any means wish to be thought to discountenance impromptu surgery where necessary in these cases. There have been brilliant successes reported from operations done by lamplight on a kitchen table, in huts miles away from city hospitals, and such records are among the proudest in surgery, but wherever possible it is the operator's duty to organize success.

The cleansing of the abdomen, while thorough, should not be vigorous, both for fear of diffusing any extravasated faecal matter and of producing further perforations.

{ From the time the knife is first taken in hand things should move with rapidity, this is only possible by system and regularity. We know of no other condition, except it be, perhaps, hæmorrhage, in which speed in operation is so imperative. In too many instances it is a race with death, and there are often anxious moments when it is questionable who will win, yet in only five of the reported cases is death known to have occurred before the operation was completed. A "death on the table" is, under all circumstances, a most painful occurrence in surgery, but it is doubly so if the surgeon has in any way to blame himself for delays that might have been obviated by a prudent mind. }

The incision is best made to the right of the median line, over the cæcal region. Many of the earlier operators employed a median incision, in most instances hypogastric, but in not a few epigastric, their results, however, and especially so with the epigastric incision, do not invite imitation. In ninety-six cases where a median hypogastric incision was employed the mortality was over 78 per cent, while in 141 cases where the right lateral incision was used the mortality was less than 70 per cent. Of course, were an abscess to be manifestly pointing in a certain region it would be absurd to open the abdomen elsewhere. Where the median incision has been

employed, it has only too often happened that the surgeon has searched the presenting small intestine diligently without finding a perforation, until he has unexpectedly lighted on the duodenum, and has then been forced to retrace his steps downward to the cæcum, thus losing valuable time, and shocking his patient by prolonged manipulation of the bowels

The length of the incision need not in abdomens of average thickness exceed four inches, as a rule, in uncomplicated cases three inches can be made to suffice, while in those patients with immensely fat abdominal walls the incision may, unfortunately, have to be extended nearly to the edge of the ribs upward and to the symphysis below. It is, on the other hand, by no means wise to endeavor too much through too small an opening, much harm may occur from blindly tugging at a coil of intestine which fails to come out through a wound, not because the latter is too small for such delivery to be physically possible, but because the bowel is retained by adhesions, the incautious rupture of which may cause much mischief

{ The incision we prefer is that through the outer half of the right rectus muscle. It is straight, simple, direct, and economical of time, the deep epigastric artery is not apt to be wounded with ordinary care, using the handle rather than the blade of the scalpel to separate the muscular fibres, it is a route that gives direct access to our landmark, the cæcum, and to that part of the small gut most often affected, it affords quite sufficient room for exploring nearly the whole abdomen, it can be extended in either direction at need, and offers excellent drainage facilities. } In those very rare cases where the perforation is in the sigmoid or in those parts of the small intestine not in reach of this wound, this incision should be temporarily closed, and another made where, from intra-abdominal exploration, it is evident that it would be nearest the seat of the trouble

(When the peritoneal cavity is opened the cæcum should be located, it is usually immediately beneath the wound or a little to the outer side. The vermiform appendix should be inspected and removed, if necessary. If extravasation is free

no packs are required. If, however, it appears that the peritonitis is fairly well localized the affected area should be walled off with large gauze pads. The ileum is next drawn into the wound and carefully examined, it is a great advantage to have two pairs of eyes examining it at the same time as it passes through the surgeon's hands, one watching the upper and one the lower surface. It is usually inadvisable to replace the gut at once on withdrawal, as this consumes valuable time, which is better spent searching for the perforation until found. If, however, more than two or three feet of the ileum have been examined fruitlessly, and there still appears to be reason to consider a perforation present, the eventrated parts should be re-examined, commencing at the highest point withdrawn, and ending at the cæcum, the coils being replaced as the return is made, but the highest coil being kept out of the belly until all the others have been replaced, as a starting-point for further search, which should proceed upward along the ileum with like manœuvres until there appears no further prospect of finding a perforation. This probability decreases as the area of greatest inflammation is left behind. The appearance the perforation will present can often be fairly accurately foretold by attention to the known pathology of the disease. If fæcal extravasation is free a medium or large-sized hole may be expected, if lymph abounds and clings to the bowel in patches, frequently beneath one of these patches will be found the pin-head lesion as a dark spot in the middle of an intensely congested Peyerian gland.

Throughout these manipulations the utmost care should, of course, be exercised to prevent chilling of the eventrated bowels. This is best secured by covering them with a hot towel, and constantly douching it and the bowels with hot saline solution, this aids, too, in washing away pus, etc. It should be seen, also, that the patient is not thus made to lie in a pool of rapidly cooling water, he should be so protected by blankets, mackintosh cloths, etc., as to maintain his bodily warmth, and, if necessary, he may even be surrounded by hot-water cans during the entire operation. If adhesions are

present, the operation is much more tedious and difficult, but fortunately they are rare

Suture —When the perforation is found all other coils of intestine should be replaced, and it should be sutured. But if the bowel is much distended with gas or faecal matter, it is well to allow it to discharge itself through the perforation outside the abdomen. Indeed, puncture of the bowels for this purpose has been employed to facilitate eventration, but we have never found it necessary to do this, although, to aid their reposition, it is sometimes nearly imperative. Any such puncture is easily closed with a couple of Lembert sutures.

Excision of the ulcer we deem not only perfectly useless, but harmful as well, since it consumes unnecessary time and might open a blood-vessel.

Black silk we think the best material for the intestinal suture, using it threaded on a round straight needle. Such a needle is more easily controlled by the fingers, and, when time is such an important element, such devices as needle-holders may well be dispensed with. Usually we prefer to apply first a row of mattress sutures parallel to the long axis of the gut, crossing the longitudinal Peyer's patch at right angles. A second row of Lembert sutures, likewise applied longitudinally, but continuous, is also employed, and in the vast majority of cases these two tiers are quite sufficient to occlude the perforation satisfactorily. At times it may be more expedient to use a purse-string suture, the application of which takes less time, and which holds well if the perforation is small and the surrounding bowel in fairly good condition. We seldom rely on Lembert sutures alone, even in several superimposed rows. We avoid, where possible, a line of suture transverse to the long axis of the gut, believing that the tension on the stitches is thus greater and that the lumen of the bowel is usually more impaired. It is unusual to find the diseased area extending as far transversely as it does longitudinally, but where this is the case in such a degree as to make suture impossible, or from other cause, the grafting of a piece of omentum over the defect, enterectomy, with end-to-end anastomosis or simply the estab-

lishment of a false anus, must be considered. The choice depends largely upon the general condition of the patient, the skill of the surgeon, the location of the perforation, and the state of the peritoneal cavity. To make a false anus consumes less time and is easier of operation to one unaccustomed to abdominal surgery. It may even be done without suture by the judicious use of gauze packs, leaving the perforation isolated and beneath the abdominal wound. Of four cases treated by the establishment of a fæcal fistula, every one died. This tremendous mortality, however, does not prove that the operation is necessarily fatal in cases of typhoid perforation, but merely that it has been employed only in exceedingly ill patients. On the other hand, of those sixteen patients who withstood the immediate shock of the operation, and in whom a fæcal fistula developed in the wound after operation, only two died,—the surprisingly low mortality of 12.5 per cent. This shows that direct drainage of the intestinal tract is actually beneficial. In this connection it is interesting to recall the treatment by the establishment of a false anus advised by some authorities in cases of colitis, and even in typhoid fever, as a means of drainage and irrigation of the large bowel. ¶

But the establishment of a fæcal fistula is sure to prolong the healing of the wound, and, in a fair proportion of cases, will require a subsequent operation for its closure. In those exceptional cases where the lesions are high in the intestinal tract, it is, of course, not to be considered, on account of the well-recognized danger of starving the patient by short-circuiting his ingested food. Moreover, it is difficult to drain the peritoneal cavity effectually through the same wound at which the bowels are emptying themselves, and there is the constant risk of reinfecting the peritoneum by leakage backward. So that, on the whole, where inversion of the perforation by suture or omental grafting is impossible, excision of the diseased portion of the gut, with circular enterorrhaphy, is by all means to be preferred. But this should not be lightly undertaken, for while cases have been recorded where the narrowed lumen of the bowel, due to inversion of the perfora-

tion, has been held responsible for death from intestinal obstruction, yet we believe that this complication is not to be apprehended, except where practically no lumen at all exists the fæces in the ileum are usually fluid, and there is no reason to expect that a stricture thus formed may not dilate sufficiently in the natural course of events to cause no further trouble

Circular enterorrhaphy may be performed satisfactorily here without mechanical appliance, those who prefer such devices may employ the O'Hara or the Laplace forceps, and the Murphy button may be used without fear of evil consequences It has been thought that this last would be liable to cause a new perforation while passing out, or would pull loose from the friable intestinal walls by its own weight, but we do not think these accidents more liable to occur in typhoid fever than in other cases Intestinal resection was employed five times in our series of cases, with only one recovery The Russian surgeons have been its chief advocates, but it is apparently too severe an operation to be usually recommended

Omental grafting is applicable as well to ulcers threatening perforation as to actual perforations The omentum is to be adjusted over the defect and retained in position by points of the interrupted suture In some cases the omentum has been found already covering in the perforation and preventing fæcal extravasation Grafting the omentum in place is in every way preferable to either establishing a false anus or to enterectomy

In selecting the special method of operation time should not be unnecessarily wasted, every surgeon knows that it is better to do the second-best thing for his patient than to let him die while a decision is being reached

Every perforation having been found and treated as seems indicated, the *toilet of the abdominal cavity* should next claim the surgeon's attention While he retains the sutured gut beneath the wound, he should, in our judgment, if there has been fæcal extravasation or if there is general peritonitis, resort to free douching of the abdominal cavity And in doing this he should remember that the perforation is now practically out

of the question, and that his only hope in saving the patient lies in combating the peritonitis. To this end a large tube, one-half inch in diameter, with multiple perforations, should be introduced through the wound, a rubber tube and a funnel being attached to its outer end, and through this should be poured gallons of hot solution. We are of the opinion that the quantity has more to do with success than the quality of the fluid used, although our own practice is to use normal salt solution in ordinary cases, and in cases with much pus, streptococcic in origin, we use first the normal salt, then equal parts of normal salt and hydrogen peroxide, and, finally, normal salt again—several quarts of each solution being employed. The temperature of these solutions should be at least 110° F, and to insure its reaching the abdomen not below this temperature, it is well for the thermometer in the receptacle from which the supply is drawn to stand at not less than 115° F. The tube through which this douching is carried out should first be applied to the pelvis, in the rectovesical space, and in females both in front of and behind the broad ligaments, it should then be carried to the left flank and loin, up even to the spleen, the right side should be similarly treated, and the spaces between the intestinal coils should finally be visited. The douching should be continued until the return fluid is clear. Some surgeons have advocated first sitting the patient up to allow all matter to drain into the pelvis, and when that had been accomplished, reversing the body into the Trendelenburg position, and then mopping out the pelvic cavity with gauze. A patient treated by these heroic manipulations recovered.

When the surgeon is satisfied that the abdominal cavity is as clean as he can make it by this method, but not before, the tube may be withdrawn, but the main part of the fluid that has not already escaped, and which is clean, should be allowed to remain.

Several of the earlier operators used carbolic acid or boric acid solutions for this douching, and, as we said before, we do not think the composition is of any particular moment, the

cleansing being largely mechanical. Some of the later surgeons, notably those at the Johns Hopkins Hospital, have, under local anæsthesia, prolonged this douching for upward of an hour, but we do not think much is gained by such a course. It is, however, unquestionable that very many patients show very marked constitutional improvement from the abdominal douching, the heat combats the shock, and the fluid is constantly absorbed, thus taking the place of or aiding an intravenous saline injection.

Many authorities are unalterably opposed to douching the abdomen at all in these cases, asserting that the infectious particles are only more widely diffused, and relying entirely on dry sponging and rubbing off of lymph patches, etc. While we have no desire to deny that these methods have in some instances been followed by the happiest results, and while we have ourselves treated cases without douching of any kind, yet we remain firm in our belief that by douching in the manner above described lies the surgeon's greatest hope of success. Moreover, we recollect that long ago Sir James Paget contended that "wounds," and, we may add, *a fortiori*, the peritoneum, "should not be scrubbed, even with sponges."

In the appendix will be found an analysis of those cases where the description of the operation was sufficiently minute to enable us to abstract the treatment in regard to irrigation, wiping, drainage, etc. It is to be regretted that most reports are so vague in these particulars as to be not adapted for such purposes. Those cases marked "wiping and drainage," with a mortality of 61 per cent, were mostly cases of purely localized peritoneal lesions, as were also those where neither irrigation nor drainage was employed, with a mortality of only 41 per cent, so the success here was only relative, and does not show that these methods are the best for all cases.

Drainage — Drainage is necessary in nearly every case. We now prefer gauze drains to the tube we formerly employed. The amount and the extent of the drains to be inserted will of course, depend on the extent of the peritonitis. In the simplest cases a wick of gauze alone may be placed to

the site of the sutures in the intestine, and the abdominal wound closed through nearly its entire length. If, however, there be any suspicion of pelvic involvement, a good-sized strip of gauze should be carried down to the pelvic floor. We commonly employ pads of sterile gauze, about six by eighteen inches in size, composed of four thicknesses, stitched together, or loose, crumpled gauze answers equally well, although not so handy. We see no advantage in iodoform or other medicated gauze in these cases, and never employ it. Some instances of poisoning from iodoform gauze indiscriminately used in abdominal surgery are within our cognizance, and the possibility of such an event alone is enough to deter one from its use. In cases of wide-spread peritonitis a second piece of gauze to the left flank, a third to the right, outside the descending and the ascending colon, respectively, a fourth above the ileum and to the inner side of the ascending colon, are advisable, and several more as may be required to hold the small intestines away from the pelvis and the site of operation. We have seldom had to use more than seven such packs. The ends projecting from the abdominal wound should be left fairly long, and those going to the pelvis or to the intestinal sutures should be indicated by a knot or a safety-pin, so as to avoid confusion later.

If the abdominal wound be very large, a suture or two may be applied at each end to somewhat diminish its size and to obviate the protrusion through the unhealed wound of a knuckle of gut, although this last complication has in no way interfered with recovery in the cases where it has occurred.

The dressing should be copious. Crumpled gauze should be applied next the wound in abundance, and over this many layers of flat gauze, the whole being retained in place by a bandage of Scultetus.

The patient is to be speedily returned to a well-warmed bed, not in the general ward, and be allowed to retain the same bed until fairly convalescent. The frequent moving of such patients is extremely undesirable. The foot of the bed may be raised twelve or eighteen inches, and the fluid will thus

readily drain out of the pelvis. Some surgeons prefer Fowler's position, with the head of the bed raised, so as to drain into the pelvis, but while good results have been obtained by both methods, the former commends itself to us as aiding in overcoming the shock, as well as making very efficient drainage.

Hypodermoclysis, or intravenous infusion of normal salt solution, may be begun now or continued if not completed as soon as the operation. When the patient comes out of ether a high enema of hot normal salt solution should be given, and may be repeated every two or three hours. It both allays the thirst and is a valuable adjunct to the abdominal drainage. A pint is readily absorbed by the colon in a short time.

AFTER-TREATMENT—If the patient reacts from the perforation, he must be nourished, but all food by the mouth is to be avoided as long as possible. Six to eight ounces of milk peptonized for a half-hour, with some prepared beef-juice, may be given by enema every two or three hours, the balance of the pint being of the normal salt solution,—fortunately there is no palate in the lower bowel, and such mixtures are well tolerated. Hypodermatic stimulation is indicated as in other cases of similar nature. Hypodermoclysis of normal salt is likewise a valuable adjuvant, and may be repeated in quantities of a pint or two every four or six hours. Indeed, we think that the more fluid that can be absorbed from the lymphatics in these ways—hypodermatically and from the colon—the better it is for the patient, it overcomes the typhoid toxæmia, which is too often the precursor of death, and drains the peritoneal cavity from the mucous lining of the intestines outward. A few hours after the operation the outer dressings will probably be found saturated with the salt solution left in the abdomen at the time of operation, and will require changing. This saturation of the outer dressings may occur every four to six hours at first, being a favorable sign, the gauze packs acting as siphons and draining the peritoneal cavity in a most satisfactory manner.

Ice to the abdomen we regard as harmless, but of doubtful utility.

We have found in analyzing these cases that the greatest number of deaths took place between eight and twelve hours after the operation. Those patients who lived more than twelve hours after the operation had a fair chance of recovery, only 59·8 per cent of them dying.

After twenty-four hours a teaspoonful of hot water may be given by the mouth every ten or fifteen minutes. Thus taken it is less apt to nauseate, and is probably all absorbed before reaching the stomach. No food should be given by the mouth until the third or fourth day at least, nutritive enemata being meanwhile continued. One or two cleansing enemata of plain water in the twenty-four hours are usually sufficient to remove all faecal matter. When mouth-feeding is begun it should be borne in mind that the patient has both typhoid fever and a sutured area in his intestine, and he should be fed accordingly. Those cases do best where, the acme of the disease being past, a fairly liberal diet can be allowed early. Those patients, on the other hand, who, although they were in fairly good condition at the time of perforation and so have borne the operation well, but have yet several weeks of fever with which to contend, are very apt to die during the second or third week after the operation.

After the third or fourth day the surgeon should begin to think about removing the gauze drains, but let him be in no hurry about it, far better for them to remain a week or ten days than to be removed too soon. They should be well moistened with salt solution or hydrogen peroxide, and be given time to absorb it, and the utmost gentleness should be used in separating them from the intestines. It should be remembered that in time the peritoneal granulations will push the gauze away as a foreign body, and if the drains cannot be readily withdrawn on the first trial the attempt should be postponed for twelve or twenty-four hours. In drawing on the gauze it is well rather to try to separate the bowel from the gauze than the gauze from the gut. This is most expeditiously done by a sort of blunt dissection with the finger. Blind tugging at the drains is a most harmful as well as painful pro-

cedure, and it cannot be too often impressed upon the dresser that the gauze will come away of itself in time, it is only for the purpose of accelerating the cure and of keeping the wound fresh that nature should be thus assisted

When the gauze has been removed it requires nice judgment to know how much to replace—this can only be learned by experience, if too much is replaced the healing of the sinus is delayed, and intestinal obstruction may be produced, if too little, a residual abscess may form in some pocket not efficiently drained, or rarely, where the adhesions are firm, intestinal obstruction may ensue from kinks of the bowel occurring from its sudden expansion on the removal of pressure

A fæcal fistula may be regarded as of good prognostic import as far as life is concerned, as was mentioned before, and it has seldom failed to heal spontaneously, though, of course, delaying ultimate recovery. If it does not heal of itself it is better for the patient to endure the necessary discomfort until he is thoroughly convalescent, as a second laparotomy during typhoid fever is to be avoided if possible. If a second perforation occur, nevertheless, a second laparotomy must be performed and similar treatment instituted. The same remark applies to intestinal obstruction from bands or adhesions. Of eight cases where more than one operation has been performed, no fewer than three patients recovered (62.5 per cent mortality), and, of these three, two endured three laparotomies

EXPLORATORY LAPAROTOMIES

Finally, a few words must be said about exploratory operations where the diagnosis is uncertain. Of twenty-six such operations where no peritoneal lesions were found, sixteen eventually recovered, only ten died, a mortality of 38.46 per cent. Of the nine fatal cases in which the duration of life after operation is known only three died in less than twelve hours. Of these three, one (Finney) died from pulmonary embolism following iliac thrombosis, the second (J. F.

Mitchell) had had severe hæmatemesis and enterorrhagia shortly before operation, and was in a very precarious condition, while in the third case (Le Conte), which lived nearly seven hours after operation, the toxæmic state previously existing persisted without material change until death. In these three cases local anæsthesia was used, and in no way can the exploratory incision be held to have had any connection with the fatal termination.

This "laparotomie blanche," therefore, as it is named by Hagopoff, is practically never a cause of death, and, in our judgment, is to be recommended in all doubtful cases, especially as in some instances the irrigation of the peritoneal cavity employed has actually seemed to exert a beneficial influence on the course of the disease.

STATISTICAL SUMMARY

ANALYSIS OF WHOLE NUMBER OF CASES

Recovered	94
Died	268
Total	362
Mortality	74.03 per cent

ANALYSIS OF CASES WHERE AGE AND SEX ARE KNOWN

AGE	MALE			FEMALE			TOTAL			MORTALITY PER CENT		
	Recov	Died	Total	Recov	Died	Total	Recov	Died	Total	Male	Female	Total
Under 10 years	3	2	5	1	3	4	4	5	9	40.0	75.0	55.5
10-15 "	9	10	19	3	3	6	12	13	25	52.6	50.0	52.0
15-20 "	6	29	35	1	2	3	7	31	38	83.0	66.6	81.8
20-30 "	16	70	86	8	19	27	24	89	113	81.4	70.3	78.0
30-40 "	13	44	57	6	6	12	19	50	69	77.2	50.0	72.4
40-50 "	8	10	18	1	2	3	9	12	21	55.5	66.6	57.1
50-60 "	0	3	3	0	1	1	0	4	4	100.0	100.0	100.0
Total	55	168	223	20	36	56	75	204	279	70.3	64.2	73.1

ANALYSIS OF CASES ACCORDING TO SEX ALONE

Sex	Recovered	Died	Total	Mortality
Male	61	190	251	75.6 per cent
Female	22	38	60	63.3 "

INTESTINAL PERFORATION IN TYPHOID FEVER 41

ANALYSIS ACCORDING TO DURATION OF PERFORATION BEFORE OPERATION

Cases operated on	Recovered	Died	Total	Mortality
First 12 hours after perforation	35	95	130	73 0 per cent
Second " " "	22	62	84	73 8 "
Third " " "	2	29	31	93 5 "
Over 36 hours "	18	37	55	67 2 "

ANALYSIS OF CASES WHERE DATE OF OPERATION IS KNOWN

Year	Recovered	Died	Total	Mortality
1884	1	0	1	0 0 per cent
1885	0	2	2	100 0 "
1886	0	1	1	100 0 "
1887	0	3	3	100 0 "
1888	0	3	3	100 0 "
1889	1	3	4	75 0 "
1890	0	1	1	100 0 "
1891	1	5	6	83 3 "
1892	0	1	1	100 0 "
1893	0	4	4	100 0 "
1894	4	11	15	73 3 "
1895	5	12	17	70 5 "
1896	6	15	21	71 4 "
1897	3	9	12	75 0 "
1898	10	25	35	71 4 "
1899	6	40	46	86 9 "
1900	14	18	32	56 2 "
1901	11	15	26	57 6 "
1902	16	21	37	56 7 "
1903	4	21	25	84 0 "

ANALYSIS ACCORDING TO LUSTRUMS

Period of time	Recovered	Died	Total	Mortality
1884-1888	1	9	10	90 0 per cent
1889-1893	2	14	16	87 5 "
1894-1898	28	72	100	72 0 "
1899-1903	51	115	166	69 2 "

STAGE OF DISEASE IN WHICH PERFORATION OCCURRED

Perforation occurring	Recovered	Died	Total	Mortality
First week of the disease	4	2	6	33 3 per cent
Second " "	16	43	59	72 8 "
Third " "	22	81	103	78 6 "
Fourth " "	11	33	44	75 0 "
Fifth " "	5	20	25	80 0 "
Sixth " "	3	3	6	50 0 "
After sixth week of disease	4	12	16	75 0 "
In a relapse	8	7	15	46 6 "
In third relapse	0	1	1	100 0 "
In convalescence	7	4	11	36 6 "

TIME ELAPSING BETWEEN PERFORATION AND OPERATION, IN DETAIL

Operation performed	Recovered	Died	Total	Mortality
Within a half-hour	0	2	2	100 0 per cent
“ one hour	0	2	2	100 0 “
“ two hours	2	4	6	66 6 “
“ three hours	3	1	4	25 0 “
“ four hours	2	12	14	85 7 “
“ eight hours	17	39	56	69 6 “
“ twelve hours	12	34	46	73 9 “
“ eighteen hours	10	32	42	76 1 “
“ twenty four hours	12	30	42	71 4 “
thirty six hours	2	29	31	93 5 “
forty-eight hours	4	16	20	80 0 “
“ seventy two hours	8	10	18	55 5 “
“ five days	4	9	13	69 2 “
“ two weeks	1	1	2	50 0 “
After two weeks	1	1	2	50 0 “

ANALYSIS AS TO THE PERFORATION

I	Number of perforation	Recovered	Died	Total	Mortality
	Single	65	171	236	72 4 per cent
	Multiple	5	30	35	85 7 “
II	Size of perforation				
	Under $\frac{1}{8}$ inch	35	37	72	51 3 “
	“ $\frac{1}{2}$ “	17	56	73	76 7 “
	Over $\frac{1}{2}$ “	7	16	23	69 5 “
III	Site of perforation				
	Within 12 inches of cæcum	32	108	140	77 1 “
	24 “ “	7	32	39	82 0 “
	“ 36 “ “	1	6	7	85 7 “
	Over 3 feet from “	1	3	4	75 0 “
IV	Perforation of				
	Cæcum or ascending colon	1	4	5	80 0 “
	Transverse colon	0	1	1	100 0 “
	Sigmoid loop	0	1	1	100 0 “
	Meckel's diverticulum	1	2	3	66 6 “
	Appendix	4	4	8	50 0 “

TREATMENT OF GUT

	Recovered	Died	Total	Mortality
Intestinal resection with end to end anastomosis	1	4	5	80 0 per cent
Intestines evacuated through the perforation or a puncture	1	1	2	50 0 “
Enterotomy for tympany	1	5	6	83 3 “

DURATION OF AFTER TREATMENT IN FATAL CASES

Time	Cases	Per Cent of Whole Number
Died on table	5	2.1
" under 1 hour	11	4.8
" " 4 hours	20	8.8
" " 8 "	24	10.4
" " 12 "	29	12.6
" " 18 "	15	6.5
" " 24 "	18	7.8
" " 36 "	17	7.4
" " 48 "	21	9.1
" " 72 "	23	10.0
" " 5 days	21	9.1
" " 1 week	7	3.1
Lived over 1 "	11	4.8
" " 2 weeks	3	1.3
" 30 days or more	4	1.8
Total	229	100.0

ANALYSIS AS TO DRAINAGE

Cases *	Recovered	Died	Total	Mortality
Requiring drainage	72	186	258	72.0 per cent
Not requiring drainage	11	18	29	62.0 "

NUMBER OF OPERATIONS PERFORMED

Cases	Recovered	Died	Total	Mortality
More than one operation performed,	37	5	8	62.5 per cent

CASES DEVELOPING A FALCUL FISTULA AFTER OPERATION

Time	Recovered	Died	Total
Within 24 hours	2	1	3
" 36 "	1	0	1
" 48 "	1	0	1
" 72 "	1	0	1
" 5 days	3	1	4
" 1 week	1	0	1
Over 1 "	1	0	1
" 2 weeks	2	0	2
Time unknown	2	0	2
Total cases	14	2	16
Mortality per cent		12.5	

Treated by	Recovered	Died	Total	Mortality
Irrigation and drainage	46	130	176	73.8 per cent
" but no drainage	7	15	22	68.0 "
No irrigation and no drainage	2	0	2	
Wiping and drainage	12	19	31	61.0 "
" but no drainage	0	2	2	100.0 "
No wiping and no drainage	2	2	4	50.0 "
Drain, no wiping nor irrigation	10	7	17	41.0 "
Wiping, irrigation, and drainage	1	10	11	90.0 "
Eventration	3	8	11	72.0 "
False anus established	0	4	4	100.0 "

* Excluding cases where patient died on the table

† Of the three patients who survived two endured three operations

	Recovered	Died	Total	Mortality
Ambulatory cases	7	16	23	69.5 per cent
Relapse after operation	6	1	7	14.3 "
Two or more relapses after operation	2	0	2	0.0 "
With other complications	8	11	19	57.8 "
With a subsequent perforation	0	12	12	100.0 "
With a second perforation not found at operation	0	3	3	100.0 "
Perforation not found	5	15	20	75.0 "
Intestinal sutures not holding	13	9	22	40.9 "
Supposed to have recovered from a previous perforation	0	2	2	100.0 "
Subsequent protrusion of bowel through wound	2	0	2	0.0 "

ANALYSIS AS TO SITE OF INCISION

Site	Recovered	Died	Total	Mortality
Median hypogastric	21	75	96	78.12 per cent
Right iliac	44	97	141	69.5 "
Left iliac, abscess pointing	2	0	2	
Median epigastric	1	3	4	75.0 "
Right hypochondriac	0	1	1	100.0 "
Multiple incisions	3	11	14	78.5 "
Drainage through loin, flank, or vagina	1	4	5	80.0 "

ANALYSIS OF CAUSE OF DEATH IN EIGHTY-NINE CASES IN WHICH IT IS GIVEN

Causes of Death after Operation	Under Twelve Hours	Under Twenty-four Hours	Under Three Days	Under One Week	Under Two Weeks	Over Two Weeks	Total	Per Cent of Whole Number
Pre-existent peritonitis	17	6	16	4	1	0	44	49.4
Toxæmia of typhoid fever	2	0	5	2	0	0	9	10.1
Peritonitis from subsequent perforation	0	0	3	2	3	2	10	11.2
Exhaustion	0	0	0	1	3	1	5	5.6
Intestinal hemorrhage	0	0	1	2	0	0	3	3.4
Intestinal obstruction	0	0	3	0	0	0	3	3.4
Other causes, uninfluenced by operation	7	0	8	0	0	0	15	16.8

ANALYSIS OF MISCELLANEOUS LAPAROTOMIES DURING TYPHOID FEVER

Operations for	Recovered	Died	Total	Mortality
Appendicitis	12	4	16	25.0 per cent
Disease of gall bladder	4	8	12	66.6 "
Abscess of liver	1	1	2	50.0 "
Diseases of pelvic organs	5	0	5	
Suppurating mesenteric glands	0	3	3	100.0 "
Intussusception	0	1	1	100.0 "
Chronic intestinal obstruction	1	0	1	
Peritonitis of unknown cause	2	1	3	33.3 "

LIST OF CASES ANALYZED

NB—References to Keen, from Nos 1 to 83 inclusive, refer to the tables in "Surgical Complications and Sequels of Typhoid Fever," Philadelphia, 1898, from Nos 84 to 158 inclusive, to the tables in "Surgical Treatment of Typhoid Fever," New York State Medical Association Transactions, 1899. References to Finney are to tables in Johns Hopkins Hospital Reports, vol viii

INTESTINAL PERFORATION

No	Operator	Result	Reference
1	Abbe	Recov	New York Med Record, Jan 5, 1895 Keen, 25 Finney, 1
2	"	Died	Keen, Trans New York State Med Assoc, 1899 Keen, 85
3	"	"	Ibid Keen, 84
4	Alexandrioff	"	Journ de Clin et Therapeut Infantiles, Paris, 1894, ii 735 Lactop, Khlruig Obshtsh v Mosk, 1891, x 121-129, in ANNALS OF SURGERY, 1897, i 267 Keen, 27
5	Allen, D P	"	American Journ Med Sciences, January, 1902, p 43
6	"	"	Ibid, p 50
7	Allingham	"	Trans Clin Soc London, vol xxvi Brit Med Journ, 1894, vol i p 578 Keen, 24 Finney, 3
8	Anderson	Recov	Brit Med Journ, July 23, 1898 Keen, 86
9	Andrews	"	ANNALS OF SURGERY, 1902, vol xxxvi, p 623
10	Armstrong	Died	Montreal Medical Journal, Feb, 1897, p 601 Keen, 52 Finney, 4
11	"	"	Brit Med Journ, 1896, vol ii p 1621 Keen, 53
12	"	"	Ibid Keen, 54
13	"	"	Ibid Keen, 55
14	" (Reporter)	"	Ibid Keen, 56
15	" "	"	Ibid Keen, 57
16	" "	"	Ibid Keen, 58
17	"	"	Keen, 79
18	Audet	"	Archives de Méd et de Pharmacie Milit, 1899, xxxiv, p 134
19	"	"	Ibid
20	Auvray	"	Bull et Mém de la Soc Anat de Paris, jan, 1901, p 65
21	"	"	Ibid, p 66
22	Baleh	"	Trans Amer Surg Assoc, 1900, p 419, Case 24
23	Ballance	"	Cargill, Brit Med Journ, Dec 15, 1900, p 1738
24	Banzet	"	F Junqua, Thèse de Paris, 1901, p 60
25	Bartleet	"	Medical News, November, 1887
26	Beach	"	Trans Amer Surg Assoc, 1900, p 410, Case 9 Boston Med and Surg Journ, Oct, 1893, p 390 Keen, 87 (Age given here as fifteen years)
27	Beckett	"	South California Practitioner, 1899, xiv, 111 Keen, 88
28	Bell, James	"	Medical Chronicle, September, 1895 p 401 Keen, 18
29	"	"	Ibid Keen 21

No	Operator	Result	Reference
30	Berg	Recov	New York Medical Record, March 23, 1901, p 441
31	Bigger	Died	British Medical Journal, 1899, vol 1 p 89 Keen, 89
32	Blake	"	Bost Med and Surg Journ, Feb 5, 1903, p 149 Case 10
33	Bland Sutton	"	Trans Clin Soc London, vol xxvii Brit Med Journ, 1894, vol 1 p 578 Keen, 23 Finney, 96
34	Bocalogliu	"	Mauger, Thèse de Paris, 1900, p 101
35	Bogart	"	ANNALS OF SURGERY, May, 1896 Keen, 44
36	Bolinet	"	Archives Gén de Méd, October, 1899, p 426 Mauger, Thèse de Paris, 1900, p 109
37	" (Reporter)	"	Archives Gén de Méd, 1899, p 542
38	"	"	Ibid, p 543
39	Bontecou	"	Journ Amer Med Assoc, Jan 28, 1888, p 106 Keen, 5
40	"	"	Ibid, March 29, 1890, p 455 Keen, 11
41	Bowiby	Recov	Lancet, January 30, 1897, p 312 Proc Royal Med and Chir Soc of London, vol ix Keen, 61
42	"	"	Lancet, January 10, 1903
43	Briddon	Died	ANNALS OF SURGERY, February, 1896, p 198 Keen, 43
44	Briggs, C E	Recov	Amer Jour Med Sciences, January, 1902, p 47
45	Brooks	"	Trans Amer Surg Assoc, 1900, p 415 Case 17
46	Bruce	"	Canada Lancet, March, 1902, abstracted in Amer Med, May, 1902, p 747
47	Brown, F Tilden	Died	ANNALS OF SURGERY, March, 1903, p 380
48	"	"	Ibid
49	"	Recov	Ibid
50	Brun	Died	Bull et Mém de la Soc de Chir de Paris, nov 25, 1896, p 731 Keen, 60
51	Burrill	"	Trans Amer Surg Assoc, 1900, p 417 Case 19
52	Blake, Jos A		Personal communication
53	"	Recov	Ibid
54	Cameron	Died	Philadelphia Med Journ, March 3, 1900, p 526
55	Canoli	"	Bull de Soc Lanciaiana d Osp di Roma (1895), 1896, xv 1, 9 14 Quoted from Keen, 32
56	"	"	Ibid Keen, 33
57	Cargill (Reporter)	"	Brit Med Journ, December 18, 1900, p 1738
58	"	"	Ibid
59	Celos	"	Bull et Mém de la Soc Anat de Paris, mai, 1900, p 503
60	Champlin	Recov	The Plexus, Chicago, 1899, No 5, vol v p 164 Keen, 155
61	"	Died	Ibid Keen, 156
62	"	"	Ibid Keen, 157
63	Chevallier	Recov	Bull et Mém de la Soc de Chir de Paris, juil 11, 1902, p 662
64	"	"	Ibid, p 663
65	Cholzow	Died	Ann der Russ Chir, 1896, Heft 2, in Centralbl f Chir, 1896, No 42 Keen, 59

No	Operator	Result	Reference
66	Cushing, H	Recov	Johns Hopkins Hosp Bull, 1898, vol ix p 267 Ibid Reports, vol viii p 210 Keen, 90
67	"	Died	Johns Hopkins Hosp Reports, vol viii p 218 Keen, 91
68	"	"	Ibid Keen, 92
69	"	"	Phila Med Journ, March 3, 1900, p 505 Keen, 93
70	"	Recov	ANNALS OF SURGERY, 1901, vol xxxiii p 550
71	Dalton	Died	Medical Review, St Louis, 1898, vol xxxviii p 392 Keen, 95
72	"	"	Ibid Keen, 96
73	Dalziel	"	Keen, Trans New York State Med Assoc Keen, 97
74	"	"	Ibid Keen, 98
75	"	"	Ibid Keen, 99
76	"	"	Ibid Keen, 100 Finney, 34
77	"	"	Ibid Keen, 101
78	"	Recov	Ibid Keen, 102
79	Dandridge	"	Keen, 28
80	"	Died	Cincinnati Lancet-Clinic, Aug 21, 1897, p 177 Keen, 65
81	Da Costa *	"	Allyn, Phila Med Journ, Aug 3, 1901, p 193 "Modern Surgery," 1903, 4th ed, p 724
82	Davis, G G	Recov	Univ Med Mag, May, 1900, p 172 Episcopal Hospital Records, Philadelphia
83	"	Died	Univ Med Mag, loc cit, p 173 Episcopal Hospital Records
84	"	"	Episcopal Hospital Records
85	"	"	Ibid
86	"	"	Ibid
87	"	"	Ibid
88	"	"	Ibid
89	Davis, R T	Recov	Amer Med, January 18, 1902, p 116
90	Deanesly & Malet	"	Lancet, May 25, 1901, p 1466
91	Deaver, H C	Died	Episcopal Hospital Records
92	"	"	Amer Journ Med Sci, Feb, 1898, p 191 Keen, 104
93	"	"	Episcopal Hospital Records
94	"	"	Ibid
95	"	"	Ibid
96	Deaver, J B	Recov	Amer Journ Med Sci, Feb, 1898, p 191 Keen, 103
97	"	Died	ANNALS OF SURGERY, 1898, p 144 Keen, 105
98	Delore	"	Mouriquand, Lyon Méd, juillet 12, 1903, p 41
99	"	"	Ibid, p 40
100	Depage	Recov	Journ de Chir et Annales de la Soc Belge de Chir, November December, 1902
101	Eliot	"	Trans Amer Surg Assoc, 1900, p 115 Case 16 New York Med Record, Dec 22, 1900, p 968 Keen, 94
102	Ferraresi	"	Bull de Soc Lancisiana d Osp di Roma (1895), 1896, xv 1, 9-14 (quoted in Keen) Keen, 31

* See also Nos 360, 361, and 362

No	Operator	Result	Reference
103	Ferrier	Died	Bull et Mém de la Soc Méd des Hôpitaux, fev 8, 1901, p 112
104	"	"	Ibid, p 108
105	Finney	"	ANNALS OF SURGERY, 1897, p 233 Johns Hopkins Hospital Reports, vol viii p 187 Keen, 66
106	"	"	Ibid, loc cit Keen, 67
107	"	Recov	Ibid, loc cit, p 186 Keen, 68
108	"	Died	Johns Hopkins Hosp Reports, vol viii p 187 Keen, 106
109	"	Recov	Ibid, p 188 Keen, 107
110	"	Died	Osler, Phila Med Journ, Jan 19, 1901, p 116 Johns Hopkins Hospital Reports, vol x, No 8, p 430, Case 17
111	"	"	Johns Hopkins Hospital Reports, loc cit, Case 14, p 420
112	Gerster	Recov	Berg, New York Med Record, March 23 1901, p 443
113	Gesselewitch and Dombrowski	Died	Laitop Russk Chir, 1897, vol ii p 407 (Quoted in Keen) Keen, 69 Finney, 46
114	Gesselewitch and Wanach	"	Ibid Keen, 70 Finney, 50
115	Gesselewitch and Kadjanov	"	Ibid Keen, 71 Finney, 49
116	Gesselewitch and Wanach	"	Ibid Keen, 72 Finney, 48
117	Gesselewitch and Wanach	"	Ibid Keen, 73 Finney, 47
118	Gibbon	Recov	Pennsylvania Hospital Records
119	"	Died	Ibid
120	"	"	Personal communication St Joseph's Hosp Records, Philadelphia.
121	"	"	Ibid Polyclinic Hospital Records, Philadelphia
122	"	"	Pennsylvania Hospital Records
123	"	"	Ibid
124	"	"	Ibid
125	Godwin	"	Thornton and Godwin, Lancet, August 17, 1901
126	Goodal & Richards	"	British Med Journal, 1898, vol i p 1329 Keen, 136
127	Gosset	"	Bull et Mém de la Soc de Chir de Paris, dec 26, 1900, p 119
128	Gray	"	New York Med Record, April 22, 1899, p 567 Case 9 Keen, 108
129	Guinon (Reporter)	"	Revue Mensuelle des Malades de l'Enfance, juillet, 1899, p 290
130	Hagopoff	Recov	Bull et Mém de la Soc de Chir de Paris, juin 18, 1902, p 680
131	Haggard	Died	Trans South Surg and Gyn Congr, 1899, p 148
132	Hahn	"	Frank, Bellage zum Centralbl f Chir, 1888, vol xxiv p 51 Keen, 9 Finney, 51
133	"	"	Ibid Keen, 10 Finney, 52
134	Hare	"	Intercolonial Quarterly Journ, Feb, 1895 Keen, 29
135	Harrison, V W	"	North Carolina Med Journ, Dec 5, 1897, p 368 Keen, 82 Finney, 56
136	Harrison	"	Brit Med Journ, Oct 20, 1894 Keen, 34

No	Operator	Result	Referencee
137	Harte	Died	Pennsylvania Hospital Records
138		"	Ibid
139	"	"	Ibid
140	"	Recov	Episcopal Hospital Records
141	"	Died	Pennsylvania Hospital Records
142	"	"	Ibid
143	"	"	Episcopal Hospital Records
144	"	"	Pennsylvania Hospital Records
145	"	Recov	Ibid
146	"	"	Ibid
147	"	Died	Ibid
148	"	"	Ibid
149	"	"	Ibid
150	"	"	Ibid
151	"	"	Ibid
152	"	"	Ibid
153	"	"	Ibid
154	"	Recov	Ibid
155	"	Died	Ibid
156	"	"	Ibid
157	Hayes	"	Amer Med, Sept 6, 1902, p 379
158	"	Recov	Ibid
159	"	Died	Ibid
160	"	Recov	Ibid
161	"	"	Ibid
162	"	Died	Ibid, p 380
163	"	"	Ibid
164	Hearn	"	Ibid, May 2, 1903, p 700
165	Henneid	"	Med Rev, St Louis, 1898, vol xxxvii, p 392 Keen, 109
166	Heutreaux and Waquet	Recov	Mauger, Thèse de Paris, 1900, p 112
167	Heuston	"	Brit Med Journ, November 16, 1901
168	Hill, W	"	Keen, 40
169	Hollis	Died	Lancet, 1896, vol 1 p 1284 Keen, 50
170	Hotchkiss	"	N Y Med Journ, Jan 11, 1896 Keen, 42 Finney, 59
171	Hutchinson, J P	Recov	Pennsylvania Hospital Records
172	"	Died	Children's Hospital Records, Philadelphia
173	"	"	Episcopal Hospital Records
174	"	"	Ibid
175	"	"	Lloyd and Coley, Phila Med Journ, Jan, 1903, p 133 (Methodist Hospital Records, Philadelphia)
176	"	Recov	Episcopal Hospital Records
177	"	Died	Pennsylvania Hospital Records
178	"	Recov	Ibid
179	Hutchinson, J A	Died	Keen, 77 Finney, 60 Mauger, 70
180	"	"	Keen, 78
181	Hill, C L	Recov	Petry, Phila Med Journ, Dec 13, 1902, p 936
182	Jackson	Died	N Y Med Record, Oct 7, 1899, p 519 Keen, 110
183	Jones	Recov	Annals of Surgery, July, 1901
184	Kadjan	"	Gesselewitch, St Petersburg med Woch, 1898, n f 15 No 3 s 21
185	Kammerer	"	Seibert, Archives of Pediatrics, Sept, 1902
186	Kholtzoff	Died	La Presse Méd, mai 18, 1898 p 271

No	Operator	Result	Reference
187	Kimura	Died	Sei-i-Kwai Med Journ, 1890, vol ix p 55, quoted in Brit Med Journ, 1890, vol li p 777 Keen, 14
188	Kingsley	"	ANNALS OF SURGERY, Mar, 1897, p 233 Keen, 30 Finney, 63
189	Kirkpatrick	"	Keen, 80
190	Korte	"	Archiv f klin Chir, 1892, vol xlv p 646 Keen, 19 Finney, 65
191	Kropowski	Recov	Gesselewitch, St Petersburg med Woch, 1898, n f 15 No 3, s 23 Keen, 111
192	Laidley	Died	Amer Journ of Obst, Nov, 1895, p 791 Keen, 38
193	Laplace	"	Tyson, Trans Coll Phys Phila, 1902, p 133 Personal communication from Prof Tyson
194	Le Conte *	Recov	ANNALS OF SURGERY, 1901, vol xxxiii p 645
195	"	Died	Pennsylvania Hospital Records
196	"	"	Ibid
197	"	"	Ibid
198	Legueu	"	Mauger, Thèse de Paris, 1900, p 107
199	"	"	Bull et Mém de la Soc de Chir de Paris, dec 26, 1900, p 1156
200	"	Recov	Ibid, loc cit, p 1157 Loison, Revue de Chir, 1901, vol xxiii p 179
201	Lejars	Died	Bull et Mém de la Soc de Chir de Paris, nov, 1895 Keen, 49 Finney, 68
202	"	"	Ibid, nov 25, 1896 Keen, 76 Finney, 69
203	"	"	Ibid, dec 26, 1900, p 1158 Mauger, Thèse de Paris 1900, p 97
204	Levison	"	Vooisanger, Amer Med, Aug 22, 1903, p 318
205	Loison	Recov	Bull et Mém de la Soc de Chir de Paris, dec 5, 1900 Bull et Mém de la Soc Méd des Hôpit de Paris, fevrier 8, 1901, p 107 Revue de Chir, 1901, vol xxiii p 181
206	Lothrop	Died	Munro, Bost Med and Surg Journ, Feb 5, 1903 Case 11
207	Lucke	"	Deut Zerts f Chir, 1886 1887, Bd xxv pp 14 Med News, Nov, 1887 Trans Amer Surg Assoc, 1888, p 422
208	Lund	"	Warren, Trans Amer Surg Assoc, 1900, p 414 Case 14 Keen, 112 Finney, 70
209	"	"	Ibid, p 403, Case 2
210	"	"	Ibid, p 408 Bost Med and Surg Journ, 1900, vol i p 688, Case 5
211	Lutz	Recov	Med Review, St Louis, 1898, vol xxxvi 392 Keen, 113
212	"	"	Ibid Keen, 114
213	"	Died	Ibid Keen, 115
214	Margarucci	"	Bull di Soc Lanciaiana d Osp di Roma, 1898, xlvii 319 Quoted by Keen Keen, 116 Finney, 71
215	Marsden	Recov	Lancet, June 23, 1900
216	"	Died	Ibid

* Another patient operated on at the Pennsylvania Hospital by Dr Le Conte is convalescent, six weeks having elapsed since operation

No	Operator	Result	Reference
217	Martin, Edw	Died	Univ Med Mag, June, 1899, p 502 Keen, 117
218	"	Recov	Ibid Keen, 118
219	McArthur	Died	ANNALS OF SURGERY, 1902, vol XXXI p 624
220	"	"	Ibid
221	"	"	Ibid
222	McReynolds	Recov	Trans Coll Phys Phila, 1902, p 134 Personal communication
223	"	Died	Proceedings of Phila Acad of Surgery, April 6, 1903 Personal communication
224	"	"	Ibid
225	"	"	Ibid
226	Mieleseu	Recov	Therapeutische Monatshefte, Dec, 1902, p 631
227	Mignon	Died	Loison, Revue de Chir, Paris, 1901, vol XXIII p 179
228	Mikulicz	Recov	Volkmanns Samml Klin Vortrage, No 262 Chirurgie, April, 1884, No 83 Keen, 1 Finney, 72
229	"	Died	Verhandlungen der Deutschen Gesellschaft f Chir, VIII Kongress, s 321 Keen, 7 Finney, 74
230	Mitchell, C F	"	Pennsylvania Hospital Records
231	"	"	Ibid
232	"	Recov	Ibid
233	Mitchell, J F	"	Johns Hopkins Hosp Reports, vol V p 403 Case 11
234	"	Died	Ibid, p 412 Case 12
235	"	Recov	Ibid, p 416 Case 13 Osler, Phila Med Journ, Jan 19, 1901, p 116
236	"	Died	Johns Hopkins Hosp Reports, vol X p 423 Case 15
237	"	"	Ibid, p 426 Case 16
238	Mixter	"	Trans Amer Surg Assoc, 1900, p 410 Case 8
239	Monks	"	Munio, Boston Med and Surg Journ, Feb run 5 1903, p 149 Case 15
240	Monod	"	Bull et Mém de la Soc de Chir de Paris, nov 18, 1896 Keen, 62
241	"	"	Ibid, dec 12, 1900
242	Moore, J E	"	Northwestern Lancet, 1898, vol XXIII p 135 Keen, 119
243	Morestin,	"	Mauger These de Paris, 1900, p 104
244	Morton, T G	"	Medical News, Dec 24, 1887, p 730 Keen, 6
245	Mower White	Recov	Lancet January 26, 1901
246	Moynihan	Died	British Med Journ, 1899, vol I p 1097 Keen, 120
247	Munio	"	Burrell and Bottomly, Boston City Hospital Reports, 1898, p. 126 Keen, 122 Finney, 78
248	"	"	Trans Amer Surg Assoc, 1900, p 409 Case 7 Bost Med and Surg Journ Feb 5 1903 Case 6 Keen, 121
249	"	"	Trans Amer Surg Assoc 1900, p 409 Case 6 Bost Med and Surg Journ, 1900 vol I p 388 Case 6 Ibid, Feb 5 1903 p 149 Case 9
250	"	"	Trans Amer Surg Assoc, loc cit Case 12 Bost Med and Surg Journ, loc cit, 1903 Case 7

No	Operator	Result	Reference
251	Munro	Died	Trans Amer Surg Assoc, loc cit Case 20 Bost Med and Surg Journ, loc cit Case 8
252	"	"	Bost Med and Surg Journ, loc cit, p 148 Case 1
253	"	"	Ibid Case 2
254	"	"	Ibid Case 3
255	"	"	Ibid Case 4
256	"	"	Ibid Case 5
257	Murphy	"	Keen, 22
258	"	Recov	Keen, 41
259	"	"	Journ Amer Med Assoc, April 11, 1903, p 978
260	Muhsam	"	Deutsche med Woch, 1901, No 32, s 534
261	Muller	"	Deutsche Militararztliche Zeitsch, 1901, vol xxx s 501
262	Neilson	Died	Episcopal Hospital Records
263	"	"	Ibid
264	Nevison	"	Amer Journ Med Sciences, Jan, 1902, p 39 Case 1
265	"	"	Ibid, p 41 Case 2
266	Nichols	"	Bost Med and Surg Journ, Feb 5, 1903 Case 12
267	Nutt	Recov	McCormick, Therapeutic Gazette, Aug 15, 1903, p 513
268	Ortmann	Died	Mikulicz, Verhandlungen der Deut Gesell schaft f Chir, xviii Kongress, p 324, Keen, 7 Finney, 74
269	Panton	Recov	ANNALS OF SURGERY, Aug, 1897, p 219 Keen, 54
270	Paikin	Died	British Med Journ, 1895, vol i p 192 Keen, 37
271	Patteson	"	Taylor, Dublin Journ Med Sci, Jan, 1901, p 3
272	Pearson	Recov	British Med Journ, vol i p 1097 Keen, 125
273	Peyrot	"	Mauger, Thèse de Paris, 1900, p 25
274	"	"	Ibid, p 98
275	Pick	Died	Trans Clin Soc London, 1898, p 234 Brit Med Journ, 1898, vol i p 1328 Keen, 126
276	Platt, J E	Recov	Lancet, Feb 25, 1899, p 505 British Med Journ, 1899, vol i p 345 Keen, 127
277	"	Died	Ibid Keen, 128
278	"	"	Ibid Keen, 129
279	"	"	Keen, 130
280	"	"	Keen, 131
281	Pluyette	"	Mauger, Thèse de Paris, 1900, p 105 Archives Générales de Médecine, 1899, N S, vol ii p 539
282	Porter	"	Boston Med and Surg Journ, April 15, 1897, p 354 Trans Amer Surg Assoc, 1900, p 411 Case 10 Keen, 63 and 132 Finney, 87
283	"	"	Trans Amer Surg Assoc, 1900, p 413 Case 13
284	Post	"	Munro, Bost Med and Surg Journ, Feb 5, 1903 Case 14
285	Powers	"	Keen, 134

No	Operator	Result	Reference
286	Price, Jos	Recov	Canada Lancet, April 1898, p 386 Med and Surg Reporter, 1896, p 577 Keen, 46 Finney, 88
287	"	"	Canada Lancet, 1897, vol xxx p 385 Med and Surg Reporter, loc cit Keen, 135
288	"	"	Canada Lancet, April, 1898 Med and Surg Reporter, loc cit Keen, 45 Finney, 89
289	Rath	Died	Records of St Timothy's Hospital, Roxborough, Phila
290	"	"	Ibid
291	"	"	Ibid
292	Ricard	Recov	Bull et Mém de la Soc de Chir de Paris, juin 18, 1902, p 680
293	Ricketts	Died	Cincinnati Lancet-Clinic, April 6, 1895, p 333 Keen, 36
294	Rochard	"	Bull et Mém de la Soc de Chir de Paris, dec 26, 1900, p 1161
295	"	"	Ibid
296	Rodman	Recov	Amer Med, Nov 23, 1901
297	Rogers	Died	Trans South Surg and Gyn Congress, 1899, p 148
298	Ross, G G	"	Philadelphia Med Journ, May 2, 1903, p 748
299	Routier	"	Bull et Mém de la Soc de Chir de Paris, dec 26, 1900, p 1161 Ibid, nov 18, 1896, p 728 Keen, 51
300	Ryan	"	Australasian Medical Gazette, 1899, vol xviii p 334 Keen, 137
301	Sacquépée	"	Bull et Mém de la Soc Anat de Paris, 1899, vol lxxv p 443 Mauger, Thèse de Paris, 1900, p 99
302	Salisbury	Recov	Phila Med Journ, Aug 5, 1889, p 270 Keen, 158
303	Senn	Died	Medical News, June 8, 1889, p 622 Keen, 12 Finney, 93
304	"	"	Keen, 139
305	"	Recov	Keen, 140
306	"	Died	Keen, 141
307	Shepherd, F J	Recov	Edinburgh Med Journ 1902, vol lly p 531
308	"	"	Ibid, p 532
309	"	"	Ibid, p 534
310	Shoemaker, G E	Died	Phila Med Journ, May 31, 1902, p 981 Trans Coll Phys Phila, 1902, p 127
311	Sieur	"	Loison, Revue de Chir, Paris, 1901, vol xvii p 179
312	Sifton	Recov	Chicago Clin Review, April, 1895 Keen, 48 Finney, 94
313	Soulligoux	Died	Mauger, Thèse de Paris, 1900, p 102
314	"	"	Ibid, p 103
315	Stewart, F T	"	Pennsylvania Hospital Records
316	"	"	Ibid
317	"	"	Ibid
318	"	Recov	Ibid
319	"	Died	Personal communication Records of Polyclinic Hospital Philadelphia
320	"	"	Ibid Records of Jefferson College Hospital, Phila
321	Spellisv	Recov	Proceedings of Phila Acad of Surg, April 6, 1903

No	Operator	Result	Reference
322	Surmay	Died	L'Union Méd, 1885, vol xl p 901 Keen, 3
323	Taylor, H M	"	Virginia Med Semi monthly, Dec 10, 1897, p 516 Trans South Surg and Gyn Congr, 1899, p 140 Case 1 Keen, 83
324	"	Recov	Virginia Med Semi monthly, 1898 1899, vol iii p 719 Trans South Surg and Gyn Congr, loc cit, p 142 Case 3 Keen, 142
325	"	Died	Virginia Med Semi monthly, loc cit Trans South Surg and Gyn Congr, loc cit, p 142 Case 2 Keen, 143 Finney, 98
326	"	"	Maryland Med Journ, 1899, vol xlii p 101 Trans South Surg and Gyn Congr, loc cit, p 143 Case 4 Keen, 144
327	"	"	Trans South Surg and Gyn Congr, loc cit
328	Taylor, W	"	Dublin Journ Med Science, Jan, 1901, p 1
329	Taylor, W J	"	Trans Coll Phys Phila, 1899, p 107 Keen, 145
330	"	"	Ibid, p 108 Keen, 146
331	Theimet	"	Monod & Vanverts, Revue de Chir, 1897, vol xvii p 169, where it is quoted from Barbe, Thèse de Paris, Obs 20
332	Thompson	"	Trans Amer Surg Assoc, 1900, p 412 Case 11 Keen, 133
333	Thompson, J E	"	Trans Texas State Med Assoc, 1893, p 266 Med Chron, 1895, p 401 Keen, 20 Finney, 101
334	"	"	Med Chron, loc cit Keen, 39 Finney, 100
335	Thordike	"	Trans Amer Surg Assoc, 1900, p 406 Case 1
336	"	"	Ibid, p 416 Case 18
337	"	Recov	Boston Med and Surg Journ, Feb 5, 1903 Case 13
338	Thurston	"	Lancet, Oct 14, 1899 Ibid, Feb 1899, p 1004 Keen, 148
339	Tiffany	Died	Keen, 147 Finney, 102
340	Trojanoff	Recov	Bohnitschnara Gaseta Bothina, No 23, 1894, abstracted in Med News, 1894, vol lxxv p 609 Junqua, Thèse de Paris, 1901 Case 61 Keen, 26, 124
341	"	Died	Laitop russk Chir, 1897, vol ii p 277, in Mauger, Thèse de Paris, 1900 Case 16 Keen, 74 and 123 Finney, 103
342	Valence	"	Loison, Revue de Chir, Paris, 1901, vol xxiii p 179
343	Van Duyn	"	Keen, 149
344	Van Hook	Recov	Med News, Nov 21, 1891, p 591 Keen, 15 Finney, 104
345	"	Died	Ibid Keen, 16 Finney, 105
346	"	"	Ibid Keen, 17 Finney, 106
347	Wagner	Recov	Beilage z Centralbl f Chir, 1889, No 29, p 66 Keen, 13 Finney, 107
348	Wanach	Died	Gesselewitch St Petersburg med Woch, 1898, in n f 15, 23
349	Watson, F S	Recov	Boston City Hosp Reports, 1898, p 127 Bost Med and Surg Journ, 1896, No 13 Ibid, 1900, vol i p 688 Case 4 Trans Amer Surg Assoc, 1900, p 407 Case 4 Keen, 47

No	Operator	Result	Reference
350	Watson, F S	Died	Trans Amer Surg Assoc, 1900 p 111 Case 15
351	Warren, J C	"	Ibid, p 407 Case 3
352	Weir	"	ANNALS OF SURGERY, Dec, 1897 Keen 81 Finney, 110
353	Willard	"	Ibid, 1899, vol xxx p 503 Keen 151
354	Winiwarter	"	Polis Annal de la Soc Méd Chir de Liege 1897, vol xxxvi p 266 Keen, 152 Fin ney 86
355	Wladisslew	Recov	Gesselewitch St Petersburg med Woch 1898 vol iii, n f 15, 23 Keen, 153
356	Woodward	Died	Boston Med and Surg Journ, 1898 vol cxxxix p 544 Keen, 154
357	Yule	Recov	Edinburgh Med Journ, 1899 vol xliii p 360
358	"	Died	Ibid, p 361
359	Zeidler	"	Nitschajeff, Bolnitsch Grs Botk, 1894, p 569 in Keen 75
360	Da Costa	"	'Modern Surgery,' 4th ed, 1903, p 724
361	"	"	Ibid
362	"	"	Ibid

Mackenzie has reported (Lancet, September 26, 1903, p 867) two recoveries after operation by Battle for typhoid perforation. These are not included in the above tables.

EXPLORATORY LAPAROTOMIES

1	Aimstrong	Recov	Lafleur, Montreal Med Journ Feb, 1901, p 89
2	Auvray	Died	Bull et Mém de la Soc Anat de Paris, jan 1901 p 68
3	Beig	Recov	New York Med Record March 23, 1901, p 443
4	Briggs	"	Amer Journ Med Sciences Jan 1902, p 15
5	Bull	"	New York Med Record June 1 1901 p 873
6	Cushing, H	"	Johns Hopkins Hospital Reports, vol viii p 226
7	"	Died	Philadelphia Med Journ March 3, 1900 p 507
8	Davis, G G	Recov	Univ Med Mag, May, 1900, p 171
9	Finney	Died	Philadelphia Med Journ, March 3 1900 p 503
10	Garrow	Recov	Hamilton, Montreal Med Journ Feb, 1901 p 93
11	Harrison	"	British Med Journ Oct 20, 1894 p 865
12	Harte	"	Pennsylvania Hospital Records
13	"	"	Ibid
14	Le Conte	Died	Ibid
15	Mitchell C F	Recov	Ibid
16	Mitchell, I F	"	Johns Hopkins Hosp Rep vol x, No 8 p 453 Case 21
17	"	"	Ibid p 447 Case 19
18	"	Died	Ibid p 450 Case 20
19	Mixer	Recov	Trans Amer Surg Assoc 1900 p 419 Case 23
20	McArthur	Died	ANNALS OF SURGERY 1902 vol xxxvi (men tioned at p 622 by Dr Frank Billings)

No	Operator	Result	Reference
21	Munro	Died	Boston Med and Surg Journ, Feb 5, 1903 Case 18
22	"	"	Ibid Case 19
23	Nimler	"	Loison, Revue de Chir, Paris, 1901, vol xxiii pp 177 and 188
24	Rochard	Recov	Bull et Mém de la Soc de Chir de Paris, dec 26, 1900, p 1161
25	"	"	Ibid
26	Rodman	Died	Proceedings of Phila Acad of Surgery, April 6, 1903

REFERENCES

- ¹ Morgagni De sedibus et causis morborum, Epist 1, art 2 Berthomieu
Annales de la medecine physiologique, Paris, 1822, 1 392-398 Corrin
Archives generales de medecine, Paris, 1831, xxv 36-60 Ramsay
American Journal of the Medical Sciences, 1836, xviii 52 Louis
Archives generales de medecine, Paris, 1823, 1 17-49 Howship
Pract Obs in Surgery, London, 1816, p 264, etc
- ² Practice of Medicine, fourth edition, vol 1 p 329
- ³ Nothnagel's Encyclopædia, loc cit
- ⁴ Principles and Practice of Medicine, New York, 1899
- ⁵ Pepper's System, loc cit
- ⁶ Philadelphia Medical Journal, January 19, 1901
- ⁷ Yates American Medicine, May 2, 1903
- ⁸ Quoted in Thatcher's article on "Typhoid Fever," in the Twentieth Cen-
tury Practice of Medicine, 1899, vol xvi p 586, New York
- ⁹ Flexner American Journal of the Medical Sciences, August, 1903
Yates American Medicine, May 2, 1903
- ¹⁰ T K. Holmes Journal of the American Medical Association, March 14,
1903
- ¹¹ Philadelphia Medical Journal, March 3, 1900, p 505
- ¹² Ibid, May 2, 1903
- ¹³ American Journal of the Medical Sciences, May, 1903

THE MIXED TUMORS OF THE SALIVARY GLANDS

BY FRANCIS CARTER WOOD, M D ,
OF NEW YORK,

Instructor in Clinical Pathology, College of Physicians and Surgeons, Columbia
University, Pathologist to St Luke's Hospital

(A Study from the Department of Pathology of Columbia University)

It has long been known that the tumors of the salivary glands possess, as a rule, a very peculiar morphology which does not correspond to the structure of the tumors found in other organs. The greater number of the salivary tumors belong to a class known as mixed or, what is perhaps better, complex tumors, that is, new growths containing a considerable variety of tissues generally regarded as of mesoblastic origin, such as cartilage, myxomatous tissue, fat, and lymphoid structures. The parenchyma cells, proper, resemble morphologically either connective-tissue cells, in which case the tumors are considered as sarcomata, or endothelial cells, in which case the growths have long been called endotheliomata.

Beside these definitely mesoblastic structures these complex growths contain cells which resemble epithelial, endothelial, or connective-tissue cells, and accordingly the tumors have been considered as of epithelial, endothelial, or of a sarcomatous nature. These cells, which for convenience may be designated as parenchymal to distinguish them from the cells of the stroma, are present in greater or less abundance in the new growths, and give them their peculiar morphology. The variations which exist in the proportions between the stroma and the parenchyma and in the morphology of the cells of the stroma and parenchyma have given rise to much confusion in the classification of these tumors, and have rendered difficult the exact determination of their histogenetic relationships.

Pathologists have endeavored to escape responsibility by

coining compound titles to include all the forms of tissues found in such a complex growth, thus, adeno-myxo-chondro-sarcoma has frequently been used to designate tumors of this group. This additive method of naming tumors is quite unscientific, and gives no just idea of the pathological relations of the growth nor of its clinical character. Hansemann has carried it to an extreme. He proposes the following division of the mixed tumors which are at present generally considered to be of endothelial origin:

- 1 Endothelial Carcinoma
- 2 Endothelial Sarcoma
- 3 Endothelial Carcinosarcoma
- 4 Endothelial tumors with development of special parts of the stroma (a) Cylindroma, (b) Myxoma, (c) Chondroma, (d) Scirrhus, (e) Mixed forms with transition into sarcoma or carcinoma

5 Endothelial Adenoma

The question immediately arises in connection with the use of such a scheme of classification as to the distinctive morphology of an endothelial tumor and of endothelium. The originator of the term endothelium was His, in 1865, and by it he denoted the cellular linings of the serous cavities, of the blood-vessels, synovial membranes, lymph spaces, etc. Golgi then applied the term to certain tumors derived from the meninges and called them endotheliomata. Much opposition has arisen of late among embryologists to the use of the word endothelium as designating a particular group of lining cells, and the general trend of opinion is to replace it by epithelium. Thus, Stohr calls the cells lining the blood-vessels, epithelium, and Heitwig has shown that the probable derivation of the flat cells lining the coelom cavity is from the hypoblastic layer of the embryo, and that therefore these cells should be called epithelial. This view is shared by Klaatsch in a paper on the classification of tumors on an embryological basis. The French school also are inclined to call all flat covering cells epithelium, and for consistency, therefore, tumors arising from these cells, carcinomata or adenomata. Minot and Kollman, on the other hand,

consider the lining cells of the cœlom cavity and of the blood-vessels and lymph spaces as mesoblastic in origin, and therefore endothelium. Marchand would limit the term endothelium to the vascular linings and call all other lining cells, surface cells (Deckzellen). The name epithelium he considers should be restricted to all cells, without regard to their origin, which line hollow spaces and free surfaces, these cells lying closely together without well-developed interstitial substance. He suggests as a suitable word for all the surface layers of cells (Deckschichten) the Greek derivative, *epithem*.

In the mixed tumors of the salivary glands the parenchymal cells are arranged in long anastomosing strands which often form alveoli lined with one or more layers of flat cells. The difficulty which has arisen in the classification of these tumors lies chiefly in the determination of the histogenetic relationships of these cells. For many years they have been assumed to be derived from cells lining the connective-tissue spaces, and solely from morphological considerations have been regarded as endothelial cells and of mesoblastic origin. Now, inasmuch as the embryological status of the cells lining the lymph spaces has never been determined, a double assumption is made in ascribing to the cells of the mixed tumors an endothelial origin, for not only must the adherent of the endothelial theory show that the tumor cells are derived from the cells lining the tissue spaces, but he must also show that these cells are of mesoblastic origin, and therefore not epithelium. The chief exponent of the endothelial theory has been Rudolf Volkmann, who in 1895 published an important monograph on the endothelial tumors. Since that time the interest in this peculiar group of tumors has greatly increased, and numerous papers have appeared describing mixed tumors from various portions of the body, the writers accepting, as a rule, the general classification laid down by Volkmann and the morphological criteria which he assumed for the differentiation of the epithelial and endothelial growths. The following extract from Volkmann's monograph defines his position on the subject: "The characteristic morphological peculiarities of the endothe-

lial tumors lie in the arrangement of the tumor cells in strands and tubules, which distinguishes the growths from the sarcomata and gives them a close resemblance to the carcinomata. The cells of the tumors are often in very close relationship with the connective tissue of the spaces in which the cells lie, as evidenced by the fact that the cells remain attached to the walls of the space and do not retract when the tumor is hardened in fixing fluids, as is usual in the carcinomata. The cells of the endothelial tumors line the walls of the tissue spaces without the intervention of a layer of normal endothelial cells, such as is seen in the carcinomata where metastases extend along the lymph spaces. The cartilage of the endothelial tumor arises from the fibrous connective-tissue stroma by a softening of the intercellular substance, and the production first of a myxomatous tissue which later develops cartilage and a homogeneous intercellular tissue. Cell masses of an endothelial nature may also develop from the cartilaginous or myxomatous areas, and in many cases the spindle cells of the connective-tissue stroma must be regarded as genetically equivalent to the endothelial cells of the solid strands and tubules." According to Volkmann, the cells of the peripheral lymph spaces assume an active part in the growth of the tumor and, by their proliferation, form fresh extensions of the new growth. This has been shown to be doubtful both by Ribbert and Borst, who state that the cells of the tumor either grow into a tissue space and line the walls with flat cells or may grow over the pre-existing endothelial cells and produce the appearance of a proliferation of the endothelial cells, a condition also seen in the peripheral growth of the carcinomata. Glandular structures and growths of a carcinomatous nature are never found in the mixed tumors, all such appearances are due to modifications in morphology of the endothelial cells of such growths.

Pathologists of the French school have, however, never accepted the current view of the essentially mesoblastic origin of the cells of the tumors of the salivary glands, and have regarded the cells as derived from the epithelium of the glands, or, in the case of the pharyngeal and buccal tumors, as derived

from the small glands of the buccal mucosa. The majority of the French observers are satisfied to consider the mixed tumors as adenomata or carcinomata, and have described many of the simpler forms of the mixed tumors under this designation, reserving the name of mixed tumor for the more complicated growths containing bone or cartilage. This theory of the carcinomatous nature of these growths fails in several particulars. From a morphological point of view, if the tumors are carcinomata of the salivary glands it should be possible to trace some connection between the glandular structures and the tumor, as is sometimes possible in early growths of other glands of the body, but experience has shown that the tumors of this group are in a very large majority of cases encapsulated, and show no connection with the gland, indeed, they are often at some distance from it. From a clinical point of view, it is difficult to explain why the carcinomata of the salivary glands should differ so much in their clinical features from the carcinomata of other glands, for it is well known that these tumors may be present for twenty or thirty years without giving rise to cachexia or involving the surrounding structures. The theory of direct epithelial derivation also does not explain the presence of embryonic structures nor of cartilage, the latter tissue being present in a large proportion of these tumors. Finally, true carcinomata of the salivary glands have been observed with a morphology corresponding to those arising in the other epithelial glands and with a clinical course which is considered as characteristic of carcinoma, that is, a rapid and progressive involvement of the surrounding structures and an early invasion of the regional lymph nodes.

Pitance, in his thesis published in 1897, suggests that the direct derivation of the parenchymal cells of the mixed tumors from the highly differentiated glandular epithelium is improbable, even from a morphological stand-point, and that it is much more likely that the epithelium forming the cells of the tumor is derived from masses of cells left in or about the glands during the process of development. This mode of derivation might then explain the clinical peculiarities and the presence of

cartilage and embryonal tissues, the rudiments of which might have been left at the same time that the deposition of the glandular epithelium took place. The fact that the epithelial cells have not been in a position to develop functionally might also account for their alteration into an indifferent type not resembling very closely the normal cells of the fully functioning salivary gland. This view, merely suggested as an hypothesis, has not been generally adopted by pathologists.

An important paper on the salivary tumors by Hinsberg appeared in 1899, in which this author developed much the same idea as that of Pitance, but in greater detail and as the result of a large amount of embryological research on the anatomical conditions underlying the development of the salivary glands. He points out that in all of the nine tumors which he examined definite epithelial structures could be demonstrated. In itself this was not a new observation, as Nasse, Volkmann, Maclaure, Cavazzani, and others had figured and described pearl formation in tumors, which they, however, regarded as endothelial in nature. Cavazzani even figures spine cells, which, however, he considers as of endothelial origin. The importance of Hinsberg's work lay in the evidence which he adduced to show the very intimate relations of the parotid and the submaxillary glands to the mesoblastic structures of the first and second branchial arches.

Wilms, in a recent paper, entirely agrees with Hinsberg in considering the parenchyma of the mixed tumors as of epithelial origin, but differs from him in the embryological interpretation of some of the morphological findings in the tumors.

Landsteiner has recently published an article in which he analyzes the results of the examination of twenty-seven tumors, chiefly from the salivary glands, among them an adenoma of the parotid. Of twenty-six mixed tumors examined, he found squamous epithelium and prickly cells in ten. The epithelial remnants were found in five tumors of the parotid, in one of the submaxillary, in two of the lip, one each of the palate and the neck. All but one of the tumors containing epithelium also contained cartilage.

Ribbert, in his text-book on general pathology, and Lubarsch, in his numerous critical reviews of the subject of tumors, are both very guarded in the expression of their ideas on the origin of the cells of the so-called endothelial tumors. Ribbert especially considers the salivary mixed tumors as in all probability of epithelial origin, and his views on the general subject of endothelial new growths may be illustrated by the following quotation: "It is customary to make a diagnosis of endothelioma when, in spite of the carcinomatous arrangement of the cells, the organ in which the growth is found lacks epithelial cells. But it is to be remembered that developmental remains of epithelial tissue may be found in abnormal places, such as flat epithelium in the deep connective tissues of the neck, derived from the branchial clefts, or fragments of pancreas in the walls of the stomach or duodenum. It is quite probable that many of the so-called endotheliomata are in reality of epithelial nature, for it is exceedingly difficult at times to decide whether the cells occupy a tissue space or a lymphatic vessel. When an endothelial tumor reaches a certain size, new connective tissue and blood-vessels begin to be formed, and the resulting picture may vary greatly from the original growth. The cells then grow in more or less closely packed strands and, with the diminished fibrous tissue, a deceptive alveolar structure may be obtained in sections. A further appearance due to growth is the increasing closeness of relationship to the blood-vessels. The cells may become arranged in layers around these, giving a picture of angiosarcoma."

The remainder of the papers which have appeared during the past six years favor the view that the cells of the parenchyma are of endothelial derivation.

The evident and extreme diversity of opinion concerning the classification of the mixed tumors of the salivary glands, and the peculiar interest which attaches to them from their rarity and complicated structure, led the writer to examine a large number of growths which may properly be included in the class of mixed tumors. In the course of this study complex tumors were examined from the salivary glands, the lips, the

palate, the orbit, the antrum of Highmore, the lachrymal gland, the thyroid, kidney, ovary, testicle, and lung, as well as examples of some of the simpler types of endotheliomata from the meninges, the pleura, and the peritoneum. It seemed best to limit the present paper to the consideration of the tumors of the buccal and the salivary group, inasmuch as the embryological conditions underlying the formation of the tumors of other organs, especially the testicle and kidney, differ greatly from those connected with the origin of the salivary mixed tumors. The writer has been indebted for some of his material to the surgeons of several of the New York hospitals, and he wishes to express his obligation to Dr Robert Abbe in allowing him to use the records of six cases, to Dr Francis H Markoe for the use of five cases, to Dr Charles McBurney for the use of eight cases, to Drs B F Curtis and C L Gibson for three cases each, to Dr J H Blake for two cases, and to Dr F W Murray for one case. Case XXV was kindly given to me by Dr F S Matthews. Four other cases were put at my disposal by Dr J H Larkin, to whom I am under obligation for slides and material from his large collections of mixed tumors. The other twenty-seven tumors are from the collection of the Department of Pathology, College of Physicians and Surgeons, Columbia University, the large material of which was put at my disposal through the kindness of Professor T M Prudden, whom I also wish to thank for much assistance and advice during the progress of this study. Of the total of fifty-nine tumors from the salivary glands, lip and pharynx, selected for this report, fifty-four may be considered as undoubted mixed tumors of the so-called endothelial type. Two might perhaps be considered by most observers as sarcomata; one may possibly be an adenoma, though it does not resemble other adenomata in my collection, which are undoubted growths of an epithelial nature. Case II is not a mixed tumor in the strict sense of the term, but is of interest from an embryological point of view.

No attempt has been made to give a full clinical and anatomical description of each case, as a long series of such reports

can be found in Volkmann and the other German writers just mentioned. No morphological description, however complete, will enable one to appreciate as much of the appearance of a tumor as a drawing, so that frequent references have been made to the plates instead of giving the microscopic details in full.

It will be frequently noted during the description of the morphology of the individual tumors, that references will be made to drawings from other specimens. This is necessary simply for economy in the number of plates. A considerable number of the drawings are intended as types, and will be referred to as such. For example, Plates I and VI, Fig 1, though not drawn from the same tumor, show a morphology which is characteristic of a large number of the mixed tumors, and which may be designated as typically endothelial in nature.

DETAILS OF CASES

CASE I—St Luke's, No 2. Parotid tumor. The growth was removed from the left cheek of a male, aged thirty-nine years. The tumor had been noticed for two years, during which time it had grown slowly. The growth was hard, painless, and freely movable.

When removed the tumor was found to be roughly spherical. The surface was slightly lobular and smooth. A distinct capsule is present of from one to three millimetres in thickness. A portion of the parotid gland is still adherent to the dorsal aspect of the mass. The tumor measures roughly four by three by two centimetres.

The parenchyma of the growth is arranged in solid strands and in alveoli. The strands spread out in all directions through a soft cellular connective tissue and lose themselves in it. (Plates I and VI, Fig 1.) The cells of the strands are spindle or oval in shape with large nuclei. The chromatin of the nuclei is evenly distributed, so that a net-work is not easily made out. From the tapering ends of the strands the cells often give off long filaments to the surrounding connective tissue. The alveoli are small and oval in shape. They often lie in the course of one of the solid strands. The centre of the strands is filled with a mucous mass staining blue with hæmatoxylin. In some places the alveoli are

suggestively like the alveoli of a secreting gland, but the general type of the growth is that which has been called endothelial. There are no pearls or spine cells in the sections examined. There is no cartilage. Elastic tissue is abundant. The remains of the gland which are attached to the growth are normal. The morphology of the tumor is similar to that shown in Plate I, Fig. 1. No recurrence of the growth has taken place after five years.

CASE II—St Luke's, No 727. The tumor was removed from a seven-months-old female infant. The growth was noticed soon after birth, and its progress was slow for two months and then became very rapid. The tumor lies on the left side of face and neck over the parotid gland, with which it is in contact. Numerous dilated veins can be seen on its surface. It is easily reduced in size by pressure. It measures before removal seven by four by five centimetres. On gross examination after removal, the tumor is composed of fat tissue and soft fibrous tissue. The vessels are not very noticeable in the hardened specimen. There is no capsule.

Microscopic examination shows a diffuse cellular growth composed chiefly of oval and spindle cells. The tissue resembles embryonic connective tissue rather than sarcoma. In the masses of spindle cells can be seen occasional alveoli of cylindrical epithelium entirely distinct from the rest of the growth, which resemble the alveoli seen in the tumors regarded as of endothelial nature. There is a moderate amount of fat scattered through the specimen. No cartilage is present, no form of degeneration either in cells or stroma. Elastic tissue is not abundant. This tumor, though perhaps not properly classed as an endothelioma, seems of sufficient interest to include here, for it is an excellent example of a congenital tumor of the parotid region containing fibrous tissue of a cellular, embryonic type, and also distinct epithelial remains derived in all probability from rudiments of the parotid. No recurrence in three years.

CASE III—St Luke's, No 1675. Male, aged forty-one years, who fifteen years before had noted a small, hard nodule below and behind the right ear. The tumor was quite painless and not tender. The growth had gradually increased in size until it now measures twelve by eight centimetres. The growth has taken place in an anterior direction, so that the tumor now lies chiefly anterior to the ear, extending for some three centimetres

along the border of the inferior maxilla. The ear is pushed forward and upward by the tumor. The form of the growth is irregularly oval, and presents a number of cartilaginous nodules which project three or four millimetres above the surface. Other portions are cystic. The tumor is not adherent to the surrounding tissues. The neighboring lymph nodes are normal. The growth was removed by operation without difficulty, and no recurrence has been reported in two years.

The tumor when hardened measured seven by five by five centimetres. The cut section was pale yellow with small bluish nodules of hyaline cartilage scattered through its substance. There are many small, softened areas filled with myxomatous tissue. Some of these have broken down and formed small cysts. The capsule is of fibrous tissue about two millimetres thick and contains a few small vessels. The microscopical examination of the tumor showed it to be very largely composed of cartilage and soft embryonic connective tissue. The cellular portion of the growth was only moderate in amount.

The cartilage is in general purely hyaline, with a few oval cartilage cells in the stroma. In places, however, the connective and elastic tissue of the tumor invades the cartilage, and it becomes more cellular, and contains many long branching and spider cells, the prolongations of which join in with the fibrous tissue of the stroma. In some portions of the tumor and in the capsule the connective tissue is quite dense, but in general it is very loose and softened with mucous degeneration. Hyaline degeneration of the connective tissue is also seen to a very considerable extent, often extending over large areas, in which all trace of fibrillation is lost.

Weigert's stain for elastic fibres shows the whole growth to be traversed by a fine net-work of elastic fibres penetrating the cartilage and surrounding the alveoli of the parenchyma cells.

The parenchyma cells proper are of the so-called endothelial type. That is, they are oval or polyhedral cells with oval, deeply staining nuclei, which line small alveoli and tissue spaces. They are in intimate relation with the surrounding tissues, and may give off prolongations which are lost in the connective-tissue fibrillar among which the cells lie. There is no connective tissue between the cells when they lie in compact masses, nor does the elastic tissue pass between them under these conditions. Some of the alveoli contain masses of homogeneous hyaline material.

CASE IV —St Luke's, No 1745 The tumor was removed from the left parotid region of a man of fifty-nine years, who first noticed the tumor fifty-three years ago It was then the size of a small nut and freely movable For many years the growth was exceedingly slow, but in the last few months it has been very rapid The ear is pushed back by the growth The tumor is very hard and adherent both to the skin and the deeper tissues It cannot be moved in any direction Its surface is smooth In the neck are a few large hard nodes which have appeared recently The patient's general condition is good

The tumor was removed with some difficulty, as it was adherent to the deeper tissues, and a large number of the cervical lymph nodes had to be removed When hardened, the mass measured six by seven by twelve centimetres It is pear-shaped, with the larger portion above over the parotid The cervical fat is filled with hard, enlarged lymph nodes The internal surface, directed towards the parotid, is rough from separation of the tumor from the underlying tissues The outer portion directed towards the surface is smoothly encapsulated, and there is a thin capsule between the tumor and the remnants of parotid tissue The cut section shows two different appearances The superficial portions are transparent, with faint yellow strands running through them, the deeper are opaque and white The nodes are also opaque and white

Microscopical examination of the growth shows a similar variability in the tumor The peripheral portions possess the morphology designated as endothelial (Plate VI, Fig 1), with a soft, fibrous stroma and long branching strands and alveoli, some of the latter filled with hyaline material The deeper portions are composed of the same endothelial structures infiltrated with carcinoma The carcinomatous growth resembles that of an infiltrating epithelioma rather than that of a glandular carcinoma, such as one would expect in a carcinoma of the parotid The cells are large and flat, staining deeply with eosin In some areas intercellular spines can be seen Mitotic figures are fairly abundant The parotid which is separated from the growth by a fibrous capsule is normal in appearance and contains but little carcinomatous infiltration The nodes are filled with the carcinomatous new growth and very little lymphoid tissue remains

In the opinion of the writer, the best explanation of the con-



CASE IV —Epithelioma arising in a mixed tumor of the parotid gland

dition is that the patient had since childhood a tumor of the endothelial morphology, and that the recent rapid growth is the result of the carcinomatous change which has taken place in the epithelial cells of the so-called endothelial new growth. That the carcinoma is not derived from the parotid seems probable, for the gland is not extensively invaded, as it would be if the carcinoma were primary. Landsteiner describes a similar case in which malignant changes had taken place in a chondromatous tumor of the submaxillary gland, with the formation of growths of an epitheliomatous character which had broken through the tumor capsule and infiltrated the surrounding tissues. The regional lymph nodes were not invaded, in which point the case differs from the above.

CASE V—St. Luke's, No. 1906. The patient was a male, aged forty-four years, has always been well and strong. Six years before admission to the hospital he first noticed a swelling of the right cheek just above and anterior to the parotid gland. The tumor was freely movable in a vertical direction, but not laterally. It was not painful and was soft, feeling a good deal like a sebaceous cyst. The skin and mucous membrane of the cheek are not adherent to the growth. The removal of the tumor was carried out without difficulty, the growth being encapsulated and not involving any of the deeper tissues.

On removal it was found to be roughly oval, measuring five by four by five centimetres. The surface was covered with small nodules about five millimetres high. The cut section was uniformly opaque and of a dull yellow and white color. No cartilaginous areas could be made out.

Microscopical examination of the tumor shows a growth composed of dense fibrous tissue with only a small amount of parenchymal substance. The fibrous tissue is rather cellular in a few places, the cells being fusiform, with large oval nuclei and resembling the fibroblasts seen in granulation tissue. Scattered irregularly through the fibrous tissue are many open spaces lined in general with a single layer of flattened cells which stain deeply with eosin, much as is seen in cornified epithelium. The contents of all of these alveoli have not been preserved in Zenker preparation or in specimens hardened in alcohol and formalin, though hyaline masses are present in a few. Evidently the fluid was of a serous nature and contained but little solid matter. Some of

the spaces, however, can be explained by the fact that the cells which originally filled them have fallen out during the manipulation of the sections, for solid masses of cells resembling cornified epithelium are present in parts of the tumor. Some of these areas are quite extensive, and spine cells with epithelial fibrillations can be easily made out by suitable staining and the use of high powers. The central spaces of other of the alveoli are filled with large flat cells with faint nuclei and poorly staining cell bodies, which are much like the large flat epithelial cells seen in the alveoli of mammary adenomata in which the milk-ducts have been occluded by the tumor growth. It is evident that a considerable proportion of the parenchymal cells are of epithelial origin, though the morphology of the tumor is that described as endothelial. No recurrence in a year.

CASE VI.—The specimen was removed from a female seventy years of age. She had noticed a tumor on the inner surface of the left cheek, near the opening of Steno's duct, for at least twenty years. It was oval, movable, and quite painless. The mass had increased in size very slowly. The tumor was easily shelled out and measured about two by one and one-half centimetres. It was smoothly encapsulated and the surface was lobular. On cross section the texture was fine and the surface a yellowish white. A few scattered islands of cartilage, none over three millimetres in diameter, could be recognized by their transparency. Microscopically, the growth consisted chiefly of cartilage, soft embryonic connective tissue with spider cells, and abundant mucous degeneration, typical endothelial strands and alveoli, and, finally, well-formed epithelial pearls. The cartilage is of the hyaline variety and contains a good deal of elastic tissue. The cartilage passes imperceptibly into either the soft connective tissue or the closely packed cells of the anastomosing endothelial strands. Indeed, there are no sharp boundaries between the various tissues of the tumor. The connective tissue in the centre of the growth is very soft and contains but few cells, and these send out long fibrillæ which join with those from other cells and form a network, in the meshes of which is found the mucous substance staining deep blue with hæmatoxylin. In this tissue are seen occasional spherical cells with one or two nuclei. They exactly resemble the cells of hyaline cartilage. Epithelial masses are also present in the mucous tissue. They have no connection with the

surrounding structure, but lie isolated as small spherical groups of flattened cells. The so-called endothelial strands and alveoli possess the morphology common to these structures (Plate II, Fig 1). The alveoli are filled with hyaline masses. In other portions of the tumor the fibrous tissue is more dense though still very cellular. The epithelial pearls are found chiefly in these areas. The pearls are either quite distinct from the so-called endothelial portions of the growth, or they lie in the course of one of the long branching alveoli of endothelial cells, or they can be seen lying in the solid strands of the endothelial cells. Finally, the epithelial cells may be seen lining the walls of small cavities in the tumor. A few cells in all these masses when stained by Kromayer's method and examined in glycerin or even in balsam show intracellular bridges and the fibrillations characteristic of epithelial cells. Only a certain number of cells show this morphology, and they are chiefly the cells which take on a deep eosin stain. The cells of the so-called endothelial type do not show any such structures (Plate I, Figs 1 and 2, Plate V, Figs 1 and 2).

CASE VII—St Luke's, No 1592. The tumor was removed from a female aged fifty-six years. Three years before her admission to the hospital she noted a small nodule in left parotid region. For two years there was no increase in size, but of late the patient thinks there has been a slow but steady increase in the size of the tumor. Health perfectly good at present. The tumor measures after removal about two by three centimetres. It is lobulated and surrounded by a thin capsule. It is soft in texture, and there are a few areas of softening. Microscopically the tumor is very cellular, with the strands of cells separated from each other by a delicate fibrous stroma which has undergone hyaline degeneration, especially along the blood-vessels, which are moderately abundant. Some of the strands contain alveoli filled with hyaline material. No cartilage is present, nor definite epithelial structures, but an abundance of elastic tissue. No recurrence after a year.

CASE VIII—St Luke's, No 522. Tumor was removed from the left submaxillary region of a woman of forty-seven years. She had noticed the growth for eleven years. It was removed, and about three months after the operation she noted a recurrence, which has grown slowly for two years and for the past month quite rapidly. It is now about two centimetres in diameter and

causes pain and difficulty in swallowing. The tumor is but slightly movable and has no sharp outline. The patient's condition is good. The tumor when removed was found not to be encapsulated and measures roughly some two centimetres in diameter. It is embedded in a mass of fat, into which it merges imperceptibly. The cut section is rather soft and translucent, without any marked macroscopic characteristics.

Microscopically the growth is composed of alveoli in a connective-tissue stroma. The centre of each alveolus is filled with mucus, the periphery lined with flattened cells. No cartilage, and but very little elastic tissue is present in the recurrence, though it is usually very abundant in the primary growths of this group of tumors. The elastic tissue in a recurrent mixed tumor appears to be practically all derived from that pre-existing in the connective or other tissue invaded by the growth.

CASE IX—St Luke's, No 1131. Male, forty-five years of age. A year previous to operation had noticed a small lump size of a marble just behind and below angle of right inferior maxilla. The mass was not tender or inflamed. Soon after the growth began to affect the patient's speech, and gradually the tumor was noticed to protrude more and more into the pharynx. For the past six months growth has been rapid. The tumor at present is the size of an orange, but is freely movable, and does not interfere with the motions of the lower jaw. No recurrence after two years.

Macroscopical examination of the growth shows it to measure eight by seven by six centimetres, the shape being roughly oval. The surface is slightly lobular. The consistency is firm and elastic in general, but there are harder and softer areas. On section the tumor is seen to be composed largely of cartilage lying in a soft fibrous matrix and containing a few small cysts. The whole is surrounded by a thin even capsule not over a few millimetres in thickness. The cartilage is of the hyaline variety and is quite transparent and of a bluish tint. The cellular portions of the tumor are opaque and yellow.

Microscopical examination of the growth shows that it is made up very largely of hyaline cartilage containing in different portions a variable number of cells. The cells have the morphology of those seen in normal cartilage. About the edges of the cartilaginous masses the cells are more abundant and lose their characteristic shape. They are often spindle-shape or even epithe-



CASE IX —Large tumor containing cartilage chiefly



loid in form, and are arranged in long branching strands and spherical alveoli forming the so-called endothelial structure. The alveoli are filled with hyaline masses. Elastic tissue is not very abundant in the tumor as a whole, but in some portions of the cartilage there is a fine diffuse net-work of very fine fibres. In the cellular portions the strands are coarser and outline the alveoli.

CASE X—The tumor is a recurrent parotid tumor from a male of about fifty years. The original growth was a small tumor of the left parotid about the size of an English walnut. It was reported as a mixed tumor. One year later there was a considerable diffuse local recurrence over the parotid region which was excised. The recurrence penetrated between the lobules of the parotid and could be distinguished from it by the yellow color of the tumor. The whole mass was removed, and no recurrence has taken place at the end of three years. The material removed was of the endothelial type with anastomosing strands of flat cells forming alveoli containing hyaline material. No cartilage was present, no epithelial pearls, no large amount of elastic tissue.

CASE XI—St Luke's, No 411. The tumor was removed from a female aged twenty-six years. Five years previous to the operation a tumor the size of a pea appeared in the right parotid region, has grown slowly to the size of an English walnut. None of the lymph nodes of the neck are swollen. When removed, the tumor measured two and one-half by three by two centimetres. It is a flattened, encapsulated mass with a broad, irregular base. A small additional fragment is attached to the main mass by a pedicle.

Microscopically the tumor is chiefly made up of a soft cellular fibrous tissue with many nuclei and marked mucous and hyaline degeneration, the latter confined to the walls of the blood-vessels. Scattered unevenly through the whole are a few alveoli lined with flattened cells. A few of the alveoli contain hyaline material. No pearls or well-marked epithelial alveoli present. No recurrence in four years.

CASE XII—St Luke's, No 630. The tumor was removed from a female fifty-six years of age. Five and a half years before admission to hospital she noticed a tender spot on side of neck with a small lump. There was some pain in tumor. The growth has been very slow and gradual. The tumor is hard and lobular with a smooth surface. It lies below the angle of the jaw on the right side and is the size of a hen's egg. Skin is movable over tumor.

and the latter is movable on the deeper tissues. The tumor was easily enucleated, except for one point which was adherent to the digastric muscle. It measures after removal five by three by two and one-half centimetres. The surface is lobular but smoothly encapsulated, except for the area which was adherent to the digastric. On section the periphery of the growth is firm and very cellular, the centre, however, has softened, and there is a ragged cavity from which the degenerated tissue has escaped. No areas of cartilage can be seen.

Microscopically the growth is very cellular, the cells being arranged in tubules and long strands. The cellular areas in places have been distended by collections of mucus forming a single cyst, or the mucus may have collected in a large number of separate areas forming a large number of cysts with cellular walls the whole walled about with trabeculae of soft connective tissue. The general type of the growth corresponds to what has been called cylindroma (Plate IV, Fig 2)

Though blood-vessels are not numerous, there are many extravasations of blood in the tumor, probably the result of the operative handling of the soft tumor. No cartilage and no pearls are to be seen. Elastic tissue abundant.

CASE XIII—Recurrence of the above in about a year. The recurrence is local and in the form of a diffuse infiltration of the tissues with cells of the same type as before described—that is, flat or oval epithelial-like cells arranged in alveoli with a mass of mucous secretion in the centre. In many years the alveoli are not developed perfectly, and the cells have penetrated the tissues in long strands and masses of small cells retaining the morphology of the original tumor. No further recurrence after two years has been noticed since the thorough removal of this recurrence. The regional lymph nodes are not invaded. Very little elastic tissue in the recurrence.

CASE XIV—St Luke's, No 659. Parotid tumor removed from a male aged thirty-three years. Eleven years ago first noticed a lump about the size of a small nut, one and one-half centimetres in diameter. It increased very slowly in size and was extirpated eight years ago. After this there was some induration of the scar, but nothing was seen until two years ago, when a small recurrence was noticed slowly increasing to present size. There is no pain nor tenderness. No swelling of the neighboring lymph nodes.

The tumor occupies the right parotid region. It is adherent to the deeper tissues and to the skin. Its consistency is hard, it is quite lobular. The form is irregularly oval, somewhat larger below than above, and flattened from before backward. There is no distinct, smooth capsule, but the tumor substance proper is embedded in dense fibrous tissue, and does not ramify among the surrounding tissues. On section it is quite tough and firm, with harder and softer areas. The soft areas are quite translucent and resemble cartilage. The wound did not heal primarily, but showed a low grade infection with a corresponding rise of temperature up to 102.5° F.

The microscopical examination shows the tumor to be of a very variable structure. The whole growth is divided into lobules by connective-tissue bands, which are rather dense and contain a few spindle cells. Inside of these lobules are the following structures: (a) In some of the lobules the centre is made up of very fine mucous tissue containing only a few branching cells. These are the transparent areas resembling cartilage. (b) Areas with some mucous tissue, but in addition ramifying strands of spindle and oval cells. (c) Other lobules are filled with closely packed cellular masses resembling sarcoma, except that there is little or no connective tissue between the cells. (d) Areas which bear a strong resemblance to atrophied parotid gland with a few excretory ducts lined with cylindrical epithelium scattered through the mass of alveoli. Some of these alveoli contain hyaline material. No cartilage is found in the tumor and no pearls, but epithelial tubules lined with cylindrical epithelium are abundant, as is elastic tissue (Plate VII, Fig. 1, and Plate I, Fig. 2).

CASE XV—St. Luke's, No. 1055. Tumor removed from parotid region of a female aged forty-eight years. Nine years before the patient's admission to the hospital she noticed a small nodule behind the lobe of the left ear, which gradually increased in size for five years and then began to grow more rapidly. The tumor is now about the size of a small orange. No pain, no general symptoms, no loss of flesh have been noticed. The tumor feels somewhat elastic when palpated and is slightly movable in all directions. It lies just below the lobe of the left ear and has pushed the lobe upward by its growth. At operation, the tumor was easily shelled out from the tissues of the neck. No enlarged lymph nodes were found. The tumor when removed was an

irregularly oval mass with lobular surface and a capsule. Its dimensions were about four by five centimetres. On cross section the tissue is firm, not cystic, and contains no cartilage. In the clear, transparent stroma can be seen the opaque, yellowish areas of the cells of the parenchyma. The microscopical examination shows the growth to be composed of tubular acini lined with large round and oval cells. The lumen of the alveoli contain hyaline masses staining red with eosin and yellow with acid fuchsin. The stroma is not very cellular and shows advanced mucous degeneration. No cartilage and no true pearls can be found. Elastic tissue fairly abundant. No recurrence in two years.

CASE XVI—College, No 6314. The tumor was removed from the parotid region of a male fifty-seven years of age. One year before operation he noticed a small nodule the size of a pea in front of the left ear. The mass is now the size of a hen's egg. It is movable under the skin and on the deeper tissues and the jaw. In some portions of the growth the consistence is soft and fluctuating, in others, hard. The tumor was shelled out of the substance of the parotid gland without difficulty. It contained a cyst of considerable size. Microscopically the tumor shows a diffuse growth of oval and spindle cells arranged to form alveoli. These alveoli and branching strands of cells lie in a dense connective-tissue stroma. No cartilage is present and no epithelial structures. Tumor recurred locally in six months. No recurrence after second removal. The mass removed at the second operation includes portions of the muscles of the face and neck and lymph nodes from the anterior triangle. The morphology of the recurrence is different from that of the primary growth. It resembles angiosarcoma in the fact that the cellular masses surround the blood-vessels. There are however, portions of the growth in which the alveolar arrangement is preserved with long branching strands of cells lying in the tissue spaces. The lymph nodes show chronic hyperplasia, but no invasion by the cells of the tumor.

CASE XVII—St Luke's, No 918. Parotid tumor. The patient was a man aged fifty-five years, who had always enjoyed good health, with the exception that five years previous to his admission to the hospital he noticed a slight swelling on the left cheek above and anterior to the parotid. At that time it was about the size of a bean. Growth has been slow except for the past year, during which the increase has been rapid. At present it is about

the size of a walnut and very hard. It is adherent to the skin, but movable over the deeper tissues. Tumor was easily removed at operation, and was found to lie upon the anterior border of the parotid gland. When hardened, the growth measures four by three by three and one-half centimetres. It is slightly lobular, and the cut section is pale and shows a large amount of fibrous tissue. Microscopically the growth contains a large amount of fibrous tissue, which is dense and contains only a very small amount of hyaline degeneration. The parenchyma is of a distinctly adenomatous type with papillary outgrowths into the alveoli. The papillary projections and the alveoli are lined with high cylindrical epithelium, and the lumina are filled with mucus staining blue. In some areas the alveoli are closely filled with cells. At the periphery of the tumor the cells form long strands lining the lymph spaces and resemble closely the so-called endothelial type. No cartilage is present and no epithelial pearls. The tumor would be classed as an adenoma from a morphological stand-point, and yet certain portions are of the same appearance as is seen in the endothelial tumors. No recurrence.

CASE XVIII—College, No 1399. The tumor was removed from a woman about forty-five years of age. One year previous some enlarged nodes had been removed from the neck just below the ear and behind (?) the sternomastoid muscle. They were considered by the operator to be tuberculous, but no examination was made. One year later there was a recurrence at the same place, and a more thorough excision was carried out. The material consists of a few fragments of a tumor which measured about two centimetres in diameter. There is a distinct capsule on portions of the fragments. Microscopic examination shows the growth to be of a cylindromatous type, with alveoli filled with mucus and surrounded by a connective-tissue stroma very poor in cells. (Plate IV, Fig 1.) No recurrence after three years.

CASE XIX—College, No 5673. The tumor was removed from a male aged sixty years. It has been present in the side of the neck just below inferior maxilla for five years, increasing slowly in size. Specimen is a small, roughly spherical, lobulated tumor, about 2.5 centimetres in diameter. The section of the fresh tumor shows it to be enclosed in a rough fibrous capsule from two to five millimetres thick. There is no evidence that the growth has extended beyond the capsule into the surrounding tissues. The

cut section is pale, irregularly lobular, and the tissue has much the same consistence and elasticity as cartilage, though it is not translucent. There are a few small hemorrhages into the centre of the tumor, but no necrosis or softening.

Microscopically the growth is composed of a rather dense fibrous stroma, in which are seen larger and smaller areas of large flat cells of an epithelioid type. These cells have large oval nuclei with a well-marked chromatin net-work. They lie in close contact with the smaller blood-vessels and capillaries, and the general alveolar arrangement is determined by this relationship. No connective tissue can be made out between the cells and the elastic tissue fibrillæ, which are rather scant in the tumor, only surround the cell areas, and lie along the vessels, but do not penetrate between the cells as in so many of the mixed tumors. (Plate III, Fig 3.) No spine cells or pearls are present, no cartilage, embryonic, connective, or lymphoid tissue.

This tumor, which was originally considered as a primary endothelioma of a lymph node, seems more properly defined as a sarcoma of the alveolar type despite the fact that there is no connective tissue between the cells. Ribbert has called attention to the fact that connective tissue is missing between the cells of a considerable number of the sarcomata, especially in the group of angiosarcomata with large cells. The reasons for considering the tumor as arising in a lymph node are based solely upon the opinion of the operator who removed the growth, under such conditions any small spherical tumor is liable to be classed as a lymph node. It is true that the morphology of the growth slightly resembles the endothelial hyperplasias of the spleen recently described by Bovand, Grancher, and others, but the numerous mitotic figures which are present in the growth under consideration—four or five often being visible in a single field—would point rather to a rapidly growing malignant tumor than to a chronic hyperplasia as in the splenic tumors mentioned above. The absence of any embryonic tissues and cartilage certainly renders doubtful the possibility of the tumor being of congenital origin. No recurrence is recorded, though two years have elapsed since the operation.

A few cases similar to this tumor have been described (Puttata, Bottcher, Chambard, Zahn, Hoffman, Volkmann), but their morphology is not easily determined from the descriptions given. Ziegler figures a similar tumor in his text-book.

CASE XX —College, No 273 Mixed tumor of the pharynx
No history is recorded except that the growth was a very large one, filling the cavity of the pharynx so that the point of origin could not be determined. The mass when removed was irregular in shape and measured about seven by five by four centimetres. The consistence of the tumor was soft, and areas of mucous tissue could be distinguished by their transparent appearance. Microscopical examination of the growth reveals three groups of tissues,—connective tissue with advanced mucous degeneration, fat tissue, and soft connective tissue in which lie branching strands of large flat and polygonal cells. The centres of some of the strands contain hyaline material staining red with eosin. Elastic tissue and mucous degeneration abundantly present in all portions of the tumor. The arrangement of the large epithelial-like cells is of especial interest and will be considered in detail.

The walls of the long tube-like alveoli are lined with two distinct layers of cells (Plate II, Fig 2),—one, the small, flat endothelial-like cells with deeply staining nuclei and small cell bodies such as are seen lining the tissue lymph spaces and smaller vessels, the other cells are large epithelial-like cells with large pale nuclei and a well-marked nuclear net-work. These cells form a single layer over the above-mentioned endothelial cells and are not very firmly adherent to them, for in the process of hardening a long strand of these cells can frequently be noticed to have become detached from the underlying layer of endothelium (Plate II, Fig 2). Two interpretations are possible, first, that the cells are produced by a new growth of the underlying layer of endothelium, and, second, that they are tumor cells which have grown into the lymph spaces and more or less completely filled them, just as one can easily observe in the periphery of a lymph node during the early stage of the invasion by a carcinoma (Plate III, Fig 1). The cells of the carcinoma may be seen in the lymph spaces as a single layer of cells lying on the normal endothelium lining.

The first explanation is that given by Volkmann and those who believe in the endothelial origin of the large flat cells of these tumors. The second point of view has two facts to support it, one is that when the endothelial cells proliferate, as can be seen in various places along the wall of the alveoli, they form masses of small cells with the same deeply staining nuclei as can be seen

lining normal lymph spaces, and these masses thrust aside the large flat cells and form small protrusions into the lumen of the alveolus (Plate III, Fig 2) The second fact is that alveoli are found which can be traced for some distance as tubes lined with cells and then end in a small compact mass with closely packed, concentrically arranged cells which resemble epithelial pearls and contain spine cells According to the second idea, then, the large flat cells are probably epithelial in origin and spread out through the tissues along preformed lymph spaces, leaving the normal endothelial lining intact Taking the tumor as a whole, the cellular portion forms but a small part of the growth, the alveoli and pearls are scattered throughout a very abundant mucous and fibrous tissue which often contains fat cells The growth is to be interpreted, in the opinion of the writer, as a tumor arising from a congenital remnant left during the formation of the pharyngeal space, and containing epithelial cells which were destined to form glands, but the normal differentiation did not take place, and the epithelium still retained an indifferent type, with a tendency to revert to the type of squamous epithelium such as lines the pharynx

CASE XXI—College, No 2136 Tumor of the vault of pharynx The growth was removed from a male aged sixty-five years The tumor had been noticed for a year, gave few symptoms, and was the size of a hen's egg It was removed by wire snare The tumor is made up of anastomosing strands of cells which lie in a loose stroma This distribution of the cells gives the section a reticulated appearance In other portions of the growth the cells are crowded together in larger and smaller alveoli The centres of these cell masses are degenerated, contain mucin and hyaline material The connective tissue is also the site of hyaline degeneration No record of recurrence No cartilage no epithelial pearls

CASE XXII—College, No 2079 The tumor was removed from a female thirty years of age It was encapsulated and oval in form, measuring four by three by three centimetres It had been present in the soft palate for two years The cross-section of the growth shows a fine, even surface, with a few trabeculae crossing it and small cartilaginous areas scattered through of irregular size, the largest, perhaps, three millimetres

Microscopically the tumor is composed of a diffuse cellular

growth of spindle and flat cells with but little connective tissue. The cells show but little alveolar arrangement, but in a few places there are distinct alveoli with high cylindrical epithelium lining the walls. The cartilage is in small amount and contains a good deal of elastic tissue. No epithelial pearls.

CASE XXIII—College, No 7315. The tumor was removed from a female twenty-six years old. It was situated on the roof of the mouth near the median line and just in front of the folds of the soft palate. The size is roughly two by two by one centimetre. The surface is smooth and slightly lobulated. The morphology is endothelial in type, with rather abundant cells and only a moderate amount of stroma. No cartilage, but abundant and elastic tissue.

CASE XXIV—College, No 10,042. Recurrence in a year. Tumor had been noticed by the patient for only ten days before its second removal, so that the growth must have been slow. Its dimensions are two by two by five centimetres. Sections show the same morphology as before. The strands of cell masses have invaded some of the mucous glands of the soft palate and have produced a very curious picture, the tumor cells forming alveoli which lie in close contact with those of the gland, and are at times difficult to distinguish from the latter, the resemblance is so close. No cartilage in the recurrence. Elastic tissue very abundant, outlining the tumor alveoli and forming a dense network throughout the whole growth, though there is less than in the primary.

CASE XXV—The specimens were removed from a woman about forty-five years of age, who had had a submaxillary new growth in the side of the neck some twenty years before. This was imperfectly removed, and numerous recurrences have taken place which have necessitated operative interference almost every year since. The growth still remains confined to the lateral aspect of the neck, and the general condition of the woman is good. The specimens under consideration represent the last three removals. The numerous fragments show traces of a capsule surrounding them and on cross section a uniform pale cellular surface. The microscopic picture varies somewhat in the earlier and later recurrences. In the earlier ones the type is still distinctly that which has been considered endothelial with anastomosing strands of cells lying in a connective-tissue stroma.

The later recurrences have lost their characteristic morphology and resemble to a certain extent the true sarcomata with flattened cells. There still remains, however, something in the aspect of these sections under the microscope that is suggestive to any one who has seen a number of the mixed tumors, something in the shape and even staining of the cell nuclei and the arrangement of the cells that differs from the ordinary picture of sarcoma. A few spindle-shaped connective-tissue cells lie between the masses of tumor cells, and these have been stained and figured by a number of observers, notably Barth, as an evidence of connective tissue between the cells of the mixed tumors. The case is chiefly interesting because of the large number of recurrences and the comparatively benign character of the growth. No involvement of the cervical lymph nodes has taken place. (Plate VI, Figs 1, 2, and 3.)

CASE XXVI—Old No 1598. The patient was a male aged forty-four years, who had a small nodule on the upper lip for two years. The tumor was removed and recurred in two years. The tumor under consideration is this recurrence. It measures about one centimetre in diameter. It lies in the tissues of the lip near the surface, but covered by the superficial epithelium. The sebaceous glands near the surface are compressed and lie flattened out on the capsule of the tumor. The latter does not infiltrate the deeper tissues. It is composed of small nodules of mucous tissue and hyaline cartilage. The mucous-tissue areas contain branching strands of cells and alveoli. The latter are in general lined with flattened cells, but in a few areas the cells are high and cylindrical, with the nuclei near the basement membrane. The cartilage is hyaline. Elastic tissue is abundantly present in the tumor.

CASE XXVII—College, No 2009. The tumor is recorded as having been present for a number of years in the upper lip. It was neatly encapsulated, and was shelled out of its bed by incising the mucous membrane of the inner surface of the lip. The tumor as removed is about the size of a bean, oval in form, and smooth of surface. It contains no visible areas of cartilage. No record has been preserved of a recurrence. Microscopically the tumor is composed of anastomosing strands of cells in a soft cellular stroma, the latter containing areas of mucous degeneration. Large alveoli filled with hyaline material are present.

in portions of the growth. No pearls or distinct epithelial structures are present. A moderate amount of elastic tissue is present.

CASE XXVIII—College, No. 2411. Female aged thirty-four years. The tumor was first noticed when patient was thirty-two years of age. It was under the ramus of the jaw on the left side. Removed after six months' fairly rapid growth. Recurrence after ten months. Second recurrence after eight months. Third recurrence after six months, involving all the left parotid region and the deeper tissues of the neck. Fourth recurrence six months later. Lymph nodes not invaded. Only portions of the various tumors have been preserved. The microscopic morphology is the same in all. The parenchyma is composed of oval or spindle cells with an alveolar arrangement, the alveoli often containing hyaline masses. The stroma shows some mucous degeneration. In the later recurrences the alveolar arrangement is less marked, and at first glance the morphology is suggestive of sarcoma, but occasional areas still show traces of the alveolar types. No cartilage in the growth, and no epithelial structures.

CASE XXIX—College, No. 6560. The tumor was removed from the left parotid region of a male aged thirty-one years. It had been present for four years. During the last year growth had been rapid. The tumor is now the size of a small orange, is elastic and movable on the deeper tissues and under the skin. Easily removed at operation by shelling out the encapsulated tumor from the parotid substance. Microscopically the growth consists chiefly of dense connective tissue containing a few spindle cells with marked hyaline degeneration of the stroma. In a few areas there are masses of spindle and stellate cells lying in soft connective tissue which has undergone mucous degeneration. Towards the periphery of the growth, close under the fibrous capsule, the morphology is that of the endothelial type, that is, alveoli and a few solid strands of cells. Alveoli contain hyaline masses. No pearls or flat epithelium are present in the tumor, but there are a few ducts lined with high cylindrical epithelium and containing masses of flat cells evidently derived from the degeneration of the lining epithelium. No cartilage is present and no lymphoid tissue, but there are a few areas of fat tissue. The tumor has not recurred in the two years since the operation.

CASE XXX—College, No 7479 The tumor was removed from the right side of the neck of a male patient aged sixty-five years For two years a mass had been noticed protruding into the pharynx just in front of tonsil It has slowly grown during that time, and now projects more externally than internally, and at about the angle of the jaw The tumor was movable in the deeper tissues and of oval form, about the size of a hen's egg When removed, the growth was found to be a lobular encapsulated mass with an area of softening in the centre Sections of the growth show it to be a typical tumor of the endothelial type with a great deal of mucous degeneration of the connective-tissue stroma No cartilage or epithelial structures can be found and no lymphoid tissue The absence of the lymphoid tissue shows that this tumor is not derived from one of the branchial clefts, though its softened centre and position were suggestive No recurrence of the growth in two years

CASE XXXI—College, No 2141 Submaxillary tumor The tumor was removed from a female aged forty-five years The tumor was first noticed as a growth under the body of the left inferior maxilla some nine years before The growth was slow The tumor measures three by four by three centimetres Attached to it is a large mass of the submaxillary gland It is partially encapsulated Microscopically the growth is an exquisite example of what has been designated cylindroma The tumor is composed of alveoli, which may be either solid or partially distended with mucus or wholly distended, so that the cells form a flattened ring at the periphery The most frequent condition is, however, a partial distention, with many small spherical areas of mucus in each alveolus This gives the tumor its peculiar morphology (Plate VII, Fig 2) No cartilage or definite epithelial structures are present The submaxillary gland has been invaded by the tumor, and the compressed alveoli of the gland are with difficulty distinguished from the alveoli of the tumor The tumor recurred locally in two years, but after a second removal there has been no recurrence in three and a half years

CASE XXXII—College, No 9565 Tumor from submaxillary region The growth is hard, lobular, and roughly spherical Its greatest diameter is about four centimetres Cross section is pale, smooth, and rather homogeneous The capsule is very thin No remnants of submaxillary tissue present No macroscopic

areas of cartilage Microscopically small masses of cartilage are fairly abundant, and also a good deal of myxomatous connective tissue The main portion of the tumor follows the conventional endothelial type, but scattered throughout the whole growth are a considerable number of epithelial pearls These are either quite discrete or are in intimate connection with the tubules and strands of the endothelial portions Spine cells can be seen in a few of the pearls, especially those in the myxomatous tissue (Plate IV, Fig 1) Elastic tissue is very abundant No recurrence in six months This case resembles the one described by Wilms, in which he showed that epithelial structures are not confined to the parotid group of tumors as Hinsberg had thought This observation renders doubtful Hinsberg's supposition that the epithelial structures might be derived from the epithelial anlagen destined to form the ear-drum

CASE XXXIII—No record is preserved of this tumor, the fragments of which are in the collection of the Department of Pathology, College of Physicians and Surgeons The label records only that the tumor is a mixed enchondroma of the parotid Sections from the fragments of tumor which remain show that the growth is in the main of an alveolar type with scattered areas of cartilage and mucous degeneration The alveoli are lined with flat cells and contain masses of hyaline material In several places in the sections well-formed pearls can be seen with epithelial spine cells Elastic tissue is very abundant throughout the growth, especially about the alveoli

CASE XXXIV—V C 9 Tumor of parotid No history is recorded of this specimen The material consists of a few blocks of tissue evidently from a tumor of six or eight centimetres in diameter Some of the fragments show a distinct capsule Microscopically the tumor is divided by trabeculæ into alveoli of irregular size These alveoli are lined and filled by a cellular mass which also forms alveoli These smaller alveoli are often surrounded by a single layer of cells and contain masses of mucus which stain deep blue with hæmatoxylin No cartilage is present and no great amount of elastic tissue At one side of the growth is a remnant of much compressed parotid gland, but no invasion of the gland tissue by the tumor has occurred (Plate VII, Fig 3)

CASE XXXV—The tumor was removed from the outer surface of the lower lip of a male patient of thirty-three years The

growth was oval in form and measured two by one and one-half by one and one-half centimetres. It had been noticed as a small mass about the size of a pea since childhood, and had grown slowly ever since. The only discomfort noticeable was due to the mechanical interference with swallowing and speaking. An ulcerated surface had been noticed for the past month on the most prominent portion of the tumor. The tumor was movable in the tissues of the lip but quite closely adherent to the skin, so that it was impossible to shell out the growth. Microscopic examination of the tumor shows it to be of the endothelial type with a large amount of mucous degeneration of the connective-tissue stroma. Very few alveoli are to be seen, the cells lying, as a rule, in anastomosing strands embedded in the mucous tissue. There is no cartilage present and no epithelial structures. Elastic tissue is very abundant. About the periphery of the growth, but external to the capsule, are many mucous glands, in some of which the alveoli have become atrophied by pressure, in others are still normal. The tumor has not recurred in six years.

CASE XXXVI—Old Nos 232, 241, 242. The material consists of a tumor from the parotid region with the fragments removed from a series of five recurrences, extending over some five years' time. There is no other history connected with the specimens. The primary growth is of the conventional endothelial type with abundant strands of cells occasionally forming alveoli which are filled with hyaline material. No cartilage is present, and only a moderate amount of elastic tissue. The various recurrences are of interest only as they show the gradual tendency of the growth to assume a sarcomatous type with only occasional suggestions of the alveolar structure of the original. In the last recurrence, however, the morphology is quite markedly alveolar, though not quite as evident as in the original. The case is of interest only to illustrate the possibilities of frequent local recurrences without involvement of the internal organs or the neighboring lymph nodes.

CASE XXXVII—Old No 465. The tumor was removed from a male thirty-eight years of age. He had had a small parotid tumor for fifteen years. For the last six months the tumor has grown rapidly and is now of oval form, measuring six by four by four centimetres. There is a thick, rough, fibrous capsule which surrounds the periphery of the tumor, and a mass of the

parotid gland is embedded on the internal surface of the growth. The cut surface is divided by trabeculæ with numerous lobules measuring from five to fifteen millimetres in diameter. No cartilage can be seen. Microscopically the tumor is cellular and follows generally the cylindromatous type, though a few areas are composed of solid masses of cells. Very little fat is present in the tumor and but little mucous or hyaline degeneration. Elastic tissue is also scarce. The parotid is normal. No pearls or epithelial structures are to be seen.

CASE XXXVIII—The tumor was from a male of about thirty years of age, and had been present on the inner aspect of the upper lip in the median line for many years. It was easily shelled out by incising the mucous membrane over it. When removed it was an encapsulated mass of oval form with a diameter of eight millimetres. Sections show the tumor to be composed of branching strands of oval cells in a stroma of soft connective tissue with much mucous degeneration. No epithelial structures, no cartilage, but a good deal of elastic tissue is present.

CASE XXXIX—Old No 573. An adenoma of the parotid gland. No history has been preserved of the tumor and the entire specimen consists of four fragments each about two centimetres square and five millimetres thick. The microscopical appearance of the growth is that of a true adenoma or adenocarcinoma of the parotid. It is composed of a dense fibrous stroma, the trabeculæ of which outline areas of cell alveoli. These alveoli are lined with one or two layers of cylindrical cells with large oval nuclei and a well-marked chromatin net-work, differing in this latter detail from the so-called endothelial cells. The alveoli, as a rule, contain no secretion. Remains of the ducts of the parotid are scattered through the tumor, and at one portion of the section normal parotid gland tissue can be found in close contact with the tumor cells. Another portion of the tumor shows the morphology of what has been called the endothelial type. There are long tubular alveoli lined with flattened cells, smaller alveoli containing hyaline secretion, and also alveoli containing double rows of lining cells such as have been figured in Plate II, Fig 2. No cartilage and no pearls are to be found. Elastic tissue is fairly abundant. The case is reported here merely to show that morphology counts for little in the final decision as to the histogenesis of the cells of the salivary tumors, because in a growth evidently epithe-

lial in nature, areas can be found in which the morphology alone would lead one to consider the tumor as endothelial, just as in many cases of the small congenital epithelial tumors of the skin a cylindromatous arrangement of the tumor cells is not infrequent

CASE XL—Old No 639 The tumor is from a woman aged fifty-eight years Eighteen years before the present operation, a small growth over the parotid was removed by the action of caustic The tumor has been growing ever since The growth is of oval form with the inner surface flattened, and measures eight by seven by five centimetres It is encapsulated on its outer surface and somewhat lobular The inner aspect is rough from the severing of adhesions to the deeper tissues The cut section is fine in texture and pale with transparent areas of mucous tissue and cartilage There are a few hæmorrhages into the substance of the growth No well-marked trabeculæ are present Microscopically the growth is of the cylindromatous type with few cysts The fibrous tissue is rather dense and the cells few and spindle in form A few areas of hyaline cartilage are to be seen, and in some places a large amount of mucous degeneration has taken place in the connective tissue In one portion of the growth are a few alveoli lined with high cylindrical epithelium, but these are all confined to a limited area and are not generally found There is also an area which resembles a cellular sarcoma with cells closely packed about the vessels The tumor contains a moderate amount of fat and is abundantly supplied with elastic tissue There is no history of a recurrence after removal

CASE XLI—St Luke's, No 696 Recurrence after removal of a parotid tumor The patient was a male from whose parotid region a large mixed tumor had been removed six months before No local recurrence was noticed after the operation, but the patient gave symptoms of pulmonary and other metastases A small subcutaneous nodule was removed from the side and showed a large-celled sarcoma with a tendency to alveolar arrangement of the cells No further record of the case has been obtainable The morphology of the growth is like that of the following case

CASE XLII—St Luke's, No 1590 Recurrent sarcoma of parotid The patient was a male twenty-eight years of age, who had had a tumor removed from the parotid region four months before The original growth had been noticed as a small nodule for several years Several months before its removal the growth



CASE \I II —Recurrent sarcoma of parotid

had become more rapid. No sections of the original tumor were obtainable, but the patient said the tumor had been hard and easily movable. The recurrence is a conical mass projecting from the surface of the left parotid gland. It is about four centimetres high and six centimetres in diameter at the base. The skin over the tumor is reddish, adherent, and the superficial veins are well marked. The growth is fixed to the parotid. On section, the tumor is firm, except for one area of softening, and contains no cartilage.

Microscopic examination of the growth showed it to be a large polyhedral celled sarcoma of the conventional type, with a more or less marked alveolar arrangement of the tumor cells. The only noteworthy features are the enormous number of mitotic figures present in the cells of the tumor and the slight amount of invasion of the parotid tissue. The parotid glandular tissue is atrophied in many places and replaced by connective tissue in which is a large amount of mucous degeneration. The morphology of the tumor is the same as in the recurrent Case XLI. The patient died from operation shock.

CASE XLIII—Old No 760. The specimen is a tumor of three years' duration, which is situated at the angle of the jaw superficial to the deep cervical fascia and quite movable under the skin and on the deeper tissues. It is oval, measuring about three by three by four centimetres, and smoothly encapsulated. The cut section shows a uniform pale cellular surface with small islands of hyaline cartilage scattered through it.

The microscopic examination of the growth shows it to be composed largely of a cartilaginous matrix in which lie numerous strands of cells and alveoli. The alveolar walls are lined in many places with high cylindrical epithelium, and a few areas are present in which faint intercellular bridges can be made out. No pearls are present. There is a very abundant elastic tissue network in the cartilage. The fibres also pass between the cell masses and form walls about the alveoli. This large amount of elastic tissue seems to be rather characteristic of these tumors for Spuler has not found much elastica in the chondromata.

CASE XLIV—Old No 1400. Growth was removed from a male aged thirty years, after a slow growth of two years. The tumor was situated at the angle of the jaw lying on the parotid gland. It measures after hardening four by five and one-half

by three and one-half centimetres. There is a fairly complete capsule over the various portions of the tumor, and this capsule sends off trabeculæ which divide the tumor into a series of lobules resembling those seen in a section of the pancreas. Small areas of cartilage can be seen in one portion of the growth.

The microscopical examination shows the tumor to be of the ordinary morphology generally known as endothelial with alveoli filled with hyaline material and walled with flattened cells. There are also long branching strands of cells of an epithelial type which form a meshwork throughout the soft fibrous stroma. In places the solid strands form pearl-like structures with concentric layers of closely packed cells which stain strongly with eosin and show no nuclear structure. At the periphery of these pearls and in some of the strands of flat cells intracellular bridges and fibres can be made out. A small fragment of compressed parotid and some skin are to be seen in some of the sections. Neither tissue is invaded by the growth, but both lie outside the fibrous tissue capsule of the tumor. The tumor is evidently a mixed tumor containing both epiblastic and mesoblastic tissues. No record of patient's further condition.

CASE XLV—Old No 1679. The specimen was removed from a male of sixty-three years. The tumor had grown for a year from the surface of the superior maxilla. No other history is recorded. The material as preserved in the collection of the Pathological Department is composed of a number of irregular masses which altogether form a tumor the size of a small lemon. The skin is adherent to the external surface of the growth, but is not invaded by the cells of the neoplasm. The cut surface is smooth and of fine texture. No cartilage can be seen. A thin capsule surrounds the peripheral portions of the fragments. Microscopically the tumor contains three distinct structures,—a cylindromatous type of growth, a simple tubular endothelioma, and a form in which closely packed cell areas are surrounded by septa of connective tissue which have undergone hyaline degeneration. (Plate VIII, Fig 1.) There is a moderate amount of elastic tissue present, but no cartilage and no epithelial structures.

CASE XLVI—College of Physicians and Surgeons, Old Series No 1727. The tumor was removed from the parotid region of a man aged fifty-seven years. No history has been recorded except that the tumor had been present for a number of years. The material which had been preserved consists of numer-

ous fragments which together measure some six by five by four centimetres. The outer surface of the tumor is covered with nodular elevations. The whole is surrounded by a fibrous tissue capsule. Portions of the parotid gland are adherent to the periphery of the growth. The cut section is opaque and uniform in appearance except for the presence of small areas of softening and hæmorrhage. No cartilage is visible. Microscopically the growth resembles a large-celled sarcoma, but at the peripheral portions of some of the cell masses an alveolar arrangement can be worked out. The alveoli are filled with mucus which takes a blue color with hæmatoxylin. There is no connective tissue between the individual cells. Elastic tissue is not abundant. No cartilage is present. No invasion of neighboring lymph nodes. The parotid gland is not involved. It is difficult to exactly class this tumor, for which the original diagnosis was adenosarcoma. Some observers might with perfect right insist that the morphology more closely resembles the sarcomatous type than that called endothelial. The vessels are more numerous than in the purely endothelial tumors, and in certain areas the cells are in very close relation to the vascular endothelium, giving an appearance such as is found in the angiosarcomata.

CASE XLVII—Old No 1728. The specimen is a tumor from the parotid region. No other record has been preserved. The material consists of a few blocks of tissue evidently removed from a large mass. Microscopically the growth is largely composed of myxomatous tissue with strands of cells lying in it. These cells form alveoli containing hyaline material. Small areas of cartilage are scattered throughout, not in the form of clean cut nodules, but rather in diffuse masses with large oval cells, shading off gradually into the myxomatous areas with spindle cells. The transition is very gradual, and it is often impossible to decide just where the point of separation occurs. In portions of the growth the stroma cells are arranged in well-formed alveoli with high cylindrical cells lining the walls. No pearls are present. Elastic tissue is very abundant.

CASE XLVIII—Old No 1844. The patient was a female fifty years old. Three and one-half years previous to operation a swelling appeared in front and below the right ear. The tumor has grown rapidly and is now of large size. It is slightly movable on the deeper parts. The skin is red and adherent. The

tumor is oval in form and measures thirteen by nine and a half centimetres. It is rather soft and elastic to palpation. Macroscopically the cut surface of the growth is of fine texture with numerous clear areas of mucous degeneration. There are faintly marked fibrous tissue trabeculæ throughout the tumor, and it is surrounded on its outer aspect by a thin capsule. Microscopically the growth is composed chiefly of soft fibrous tissue, which is the site of advanced mucous degeneration and closely packed cells of spindle and oval form resembling sarcoma. In portions of the growth where the fibrous tissue is more dense, however, the cells are arranged in alveoli and strands as in the endothelial type. No pearls are to be found. Elastic tissue is abundant. No record of a recurrence.

CASE XLIX.—Old No. 1858. The tumor was removed from the submaxillary region of a male aged forty, after a slow growth of seven years. The tumor measures seven by five by five centimetres and weighs 110 grammes. It is encapsulated. The surface is lobular. Trabeculæ run into the growth from the capsule and divide it into numerous secondary lobules which are filled with soft cellular masses cutting like cheese. The color of the cellular areas is pale, and there are numerous transparent spots due to mucous degeneration. Microscopically the growth varies a good deal in different portions. Some of the areas resemble an angiosarcoma, except that the cells do not lie in close contact with the vessels, but are separated from them by a thick vascular wall. In other areas the morphology is cylindromatous, with long anastomosing strands of cells separated from each other by connective tissue altered by advanced hyaline degeneration. In certain portions there is hyaline degeneration of the connective tissue with mucous degeneration of the cells bordering the degenerated connective tissue. The cells over large areas are replaced by mucous secretion. No definite epithelial structures can be found. Elastic tissue is abundant. No cartilage is present. The further history of the case is not known.

CASE L.—The tumor was removed from the left parotid region of a male of twenty-seven years. He had had a small movable tumor in this region since childhood. Growth has been very slow and constant since that time. The tumor measures about two centimetres in diameter, is easily movable in all directions, and is very hard. About two centimetres posterior to the



CASE 1 —Sketch from a photograph of a patient with a parotid tumor and congenital malformations of the ear and face

tumor is a small pedunculated growth which was congenital. It is roughly one centimetre long and one-half centimetre in diameter. The form is cylindrical and the surface is covered with fine hair. The growth is attached by a pedicle to the deep fascia. The ear also shows an auricular fistula, which was noticed at the time of birth. The tumor over the parotid is lobular and encapsulated, its cut section is white and close grained, with a few small islands of cartilage scattered irregularly throughout. Microscopically the tumor is of the conventional endothelial type with islands of cartilage and much mucous degeneration. There is nothing peculiar about the growth except that there are numerous pearls in the more cellular portions. These pearls are formed of masses of flattened cells with a central area in which no structure can be made out. At the periphery of the pearls the epithelial cells show characteristic fibrillations and intracellular bridges. Keratohyalin granules can be seen in a few cells. In the neighborhood of the pearl containing tissue are also a few cysts and branching tubules lined with a single layer of flat cells which stain deeply with eosin. These cells are of the same appearance as the epithelial cells forming the periphery of the pearls, and though no fibrillæ can be made out they resemble in morphology the other epithelial cells in the sections. Elastic tissue is abundant in the tumor.

The small pedunculated mass posterior to the tumor contains a spur of fibro-elastic cartilage, and seems most easily explained as an accessory tragus. This assumption is rendered more probable by the presence of another congenital malformation, the auricular fistula. The case is of especial interest because of the connection of a tumor containing embryonal tissues with other congenital malformations of the facial region, as evidenced by the accessory tragus and auricular fistula. No recurrence has taken place in two years.

CASE LI—Old No. 1959. Tumor removed from side of neck. No other history concerning the specimen has been recorded. The portions of the tumor which have been preserved are two flat sections measuring some three by five centimetres and one to five centimetres thick. The external surfaces are lobular and encapsulated. The cut surface is smooth and compact and contains scattered areas of cartilage. Microscopically the growth is of the endothelial type with strands and alveoli and cartilaginous

areas merging imperceptibly into the cellular masses. There is but little mucous degeneration. Well-formed pearls are present formed of flattened cells at the outer portions, and in the centre a mass of degenerated cells which stain red with eosin. In the peripheral portions of the pearls the cells can be seen to be connected by intercellular bridges, the fibres from which pass over into the cell bodies. The pearl-forming cells are in contact with those of the solid strands and alveoli of the endothelial type and continuous with the latter. The pearls do not occupy any limited area, but are scattered throughout the more cellular portions of the growth. Elastic tissue is very abundant in all portions of the growth.

CASE LII—College, No 2017. The tumor was removed from the parotid region of a female aged twenty-four years. The growth had been noticed for two years previous. The tumor is a lobular, roughly spherical mass, two centimetres in diameter. It is encapsulated. Microscopically the tumor is composed of branching strands of cells lying in a matrix of connective tissue, much of which has undergone mucous degeneration. No cartilage nor evident epithelial structures are present. Elastic tissue is moderately abundant. No recurrence.

CASE LIII—College, No 2397. The patient was a female fifty years of age. The tumor was situated in the parotid region and had been noticed for one year. The growth is a pear-shaped, encapsulated mass, measuring seven by six by four centimetres. It is surrounded by a dense fibrous capsule. Microscopically the growth is of a mixed type, showing solid masses of cells in certain areas and alveoli in others. Some of the alveoli are lined with high cylindrical epithelium. Elastic tissue is abundant. No invasion of the lymph nodes. No cartilage present, has not recurred.

CASE LIV—No record is preserved of this tumor. The specimen is designated as a myxochondroma of the parotid. The tumor measures three by three by five centimetres and is encapsulated. Ragged fragments of the parotid gland are attached to the periphery of the growth together with portions of the masseter muscle. One pole of the oval tumor is firm and shows a smooth homogeneous cut surface. The other pole has softened and broken down to form an irregular cyst cavity. The capsule is some three millimetres thick and composed of dense fibrous tissue.

Microscopically the growth is largely composed of mucous tissue with many spider cells. Scattered through this tissue are long anastomosing strands of cells which occasionally form alveoli. Parotid tissue is compressed by the tumor and somewhat atrophied, but the tumor structures have not invaded the salivary gland. Small islands of cartilage are scattered through the growth and occasional epithelial pearls can be seen.

CASE LV—The original tumor was removed from a man of fifty-five years of age. It was on the left side of the neck just under the body of the inferior maxilla. The growth had been noted for about two years. It was adherent to the deeper tissues and partly encapsulated. Microscopically it was an exceedingly cellular growth with branching strands of cells, some of which form alveoli with hyaline contents. No cartilage is present and no epithelial structures, elastic tissue is abundant. Recurrence in three months with invasion of the tissues of the neck and the periosteum of the inferior maxilla. The recurrence retains to a certain extent the alveolar arrangement of the primary growth, but is more diffuse and cellular, and invades the muscle and connective tissues of the neck. No invasion of the regional lymph nodes. The patient died a few months after the second operation.

CASE LVI—The tumor is in the collection of the Pathological Department, labelled myxosarcoma of parotid. No other record has been preserved. The growth is an oval encapsulated mass measuring about seven by five by four centimetres. In the centre is a ragged cavity formed by necrosis of the tumor cells. The tumor is divided into large alveoli by trabeculae of connective tissue. The contents of the alveoli are translucent and soft. These areas are seen to be made up of mucous tissue when examined microscopically. In this mucous tissue lie strands of cells occasionally arranged to form alveoli which contain hyaline material. No cartilage or epithelial structures are present. Elastic tissue is very abundant.

CASE LVII—St Luke's No 1792. The tumor was removed from left submaxillary region of a young woman of twenty-eight years. She had noticed the tumor for four years and thought that the growth had been very slow until three months before the operation. It is now the size of an English walnut and is freely movable in the lax tissues of the neck. The tumor when removed and hardened measured three by three and one-half by two centi-

metres The surface was 'smooth but slightly lobular, and the tumor was inclosed in a thin capsule Cross-section of the growth shows a firm white mass without visible trabeculæ Microscopically the tumor is composed of interlacing strands of cells with an occasional dilatation forming an alveolus which is often filled with hyaline material No cartilage and very little degeneration are present No epithelial structures No recurrence in six months

CASE LVIII—A small tumor removed from right submaxillary region of a woman of thirty years No history was obtained, except that no recurrence has taken place in the two years since the operation The tumor measures four by three by two centimetres The surface is rough and covered with fragments of the submaxillary gland and fibrous tissue On section the surface is very pale and translucent Some of the more cellular areas are yellow and opaque from the fatty degeneration of the cells There are a few small cysts, none over three millimetres in diameter No cartilage is visible Microscopically the growth is of the ordinary endothelial type, with no peculiar characteristics except that scattered through the tumor are well-defined alveoli lined with high cylindrical epithelium which is often fatty These alveoli bear a striking resemblance to the atrophic ducts of the submaxillary tissue which are adherent to the periphery of the tumor At one portion of the growth near the periphery the alveoli are filled with flat epithelial cells which are arranged to form imperfect pearls No cartilage is present in the growth, and very little mucous degeneration of the connective tissue is to be found Fragments of this tumor were examined for glycogen both before and after hardening, but none could be demonstrated Elastic tissue abundant (Plate VII, Fig 1) Some areas of the tumor show excellently the production of the morphological appearances, which have been called cylindromatous by the softening of the connective-tissue trabeculæ, many of which have undergone hyaline degeneration (Plate VII, Fig 2)

CASE LIX—The specimen has no record except that it was removed from the parotid gland The amount of material indicates that the tumor must have been of the size of a man's fist The larger portion of the growth is well encapsulated and endothelial in type No cartilage is present Other portions show a peculiar alveolar structure resembling a gelatinous carci-

PLATE I



FIG. 1—Case VI Endothelial portion of the tumor from the cheek which contained epithelial pearls

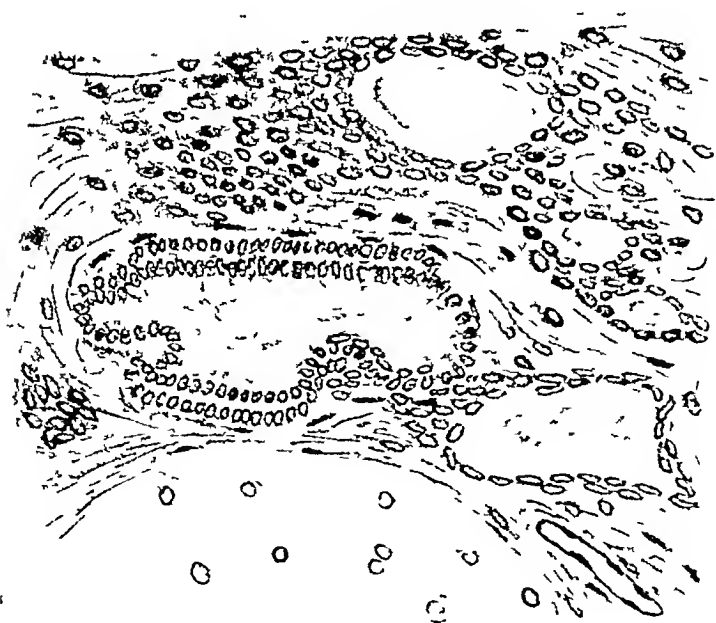


FIG. 2—Case VI Epithelial tubules, cartilage, and alveoli of the so called endothelial type.

PLATE II



FIG. 1—Case VI Endothelial type of alveoli with flat cells lining the lymph spaces and spreading out into the surrounding connective tissues

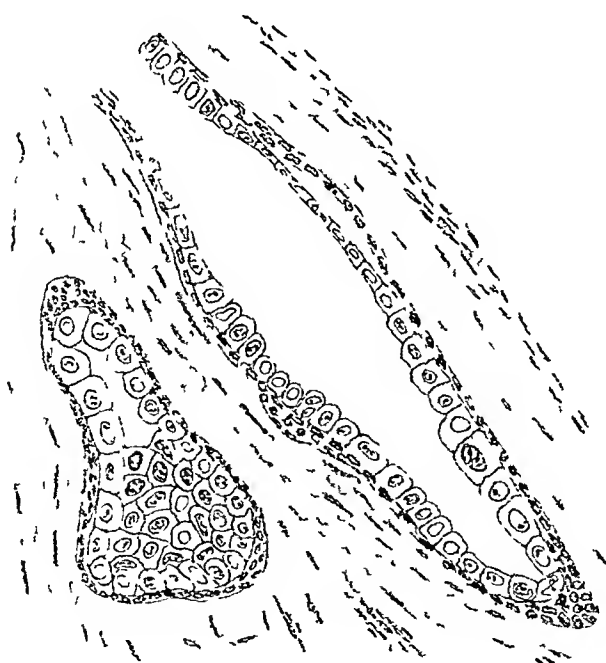


FIG. 2—Case XX Invasion of lymph spaces in a pharyngeal tumor by epithelial cells which leave the endothelial lining of the lymph space in its normal condition

PLATE III



FIG 1—Lymph channel from the periphery of an axillary lymph node invaded by the cells from a carcinoma of the breast



FIG 2—Case XX A lymph space from tumor of the pharynx showing the proliferation of the endothelium displacing the epithelial cells of the tumor from their position on the walls of the space

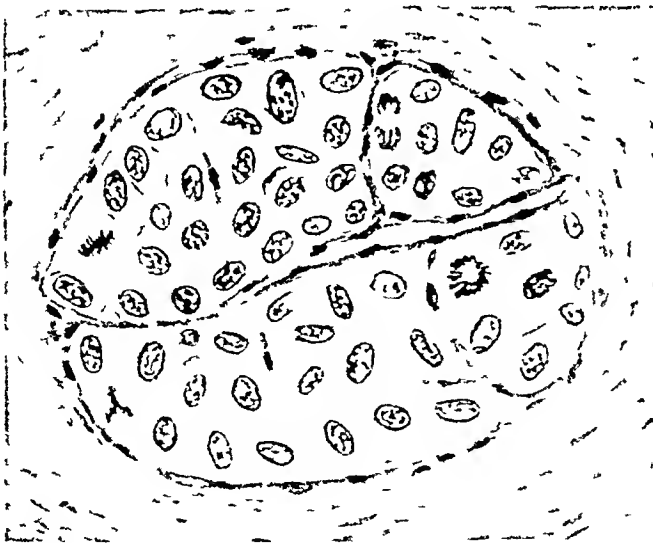


FIG 3—Case XX Section showing one of the alveoli and the close relationship of the cells to the blood vessels

PLATE IV

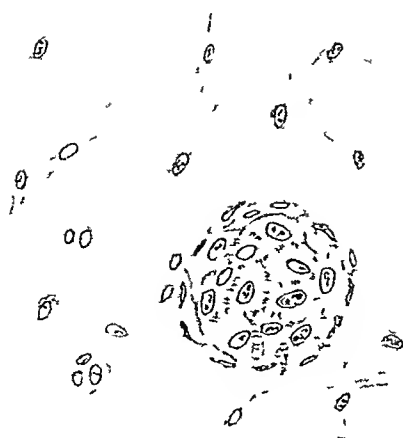


FIG 1 —Cases \I and \\\II Nest of epithelial cells in embryonic gelatinous tissue

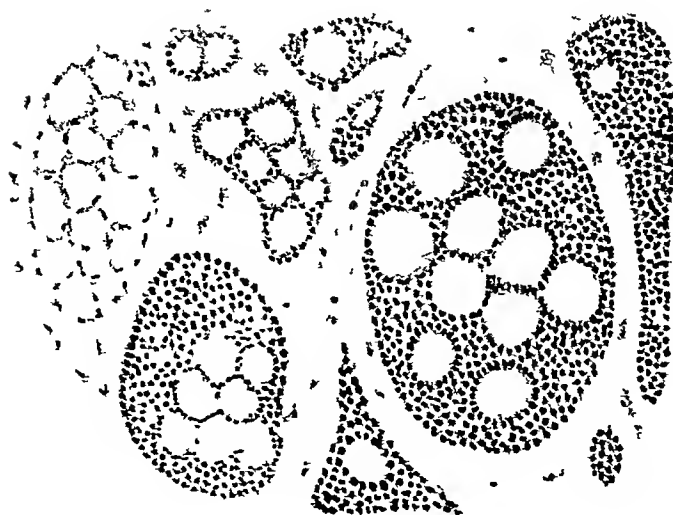


FIG 2 —Case \VIII Cylindromatous type of tumor from the neck

PLATE V

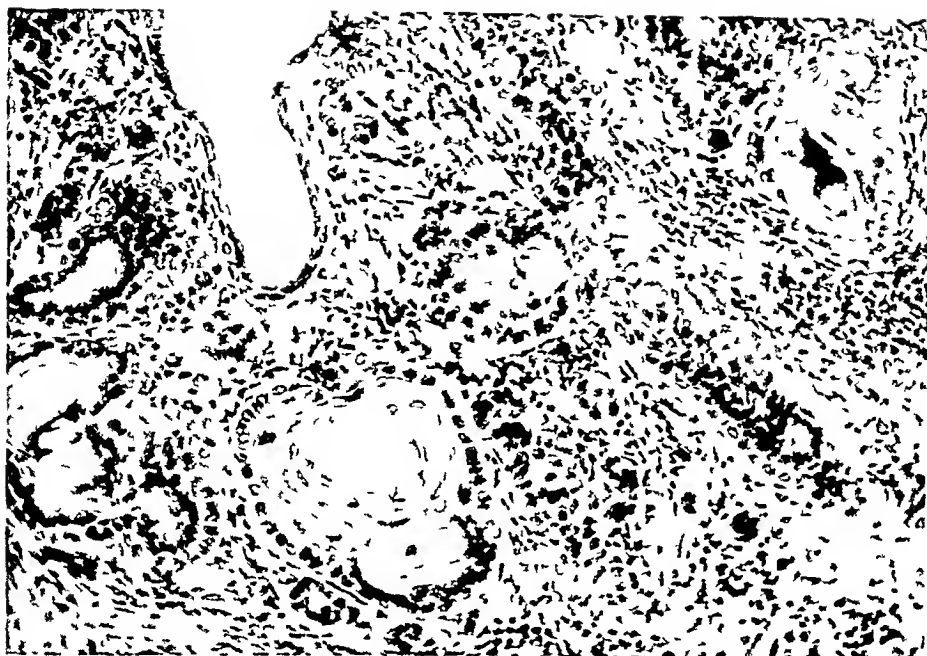


FIG. 1—Case VI Epithelial pearls in a tumor from the cheek near the parotid gland. Other portions of the growth are of the endothelial type.

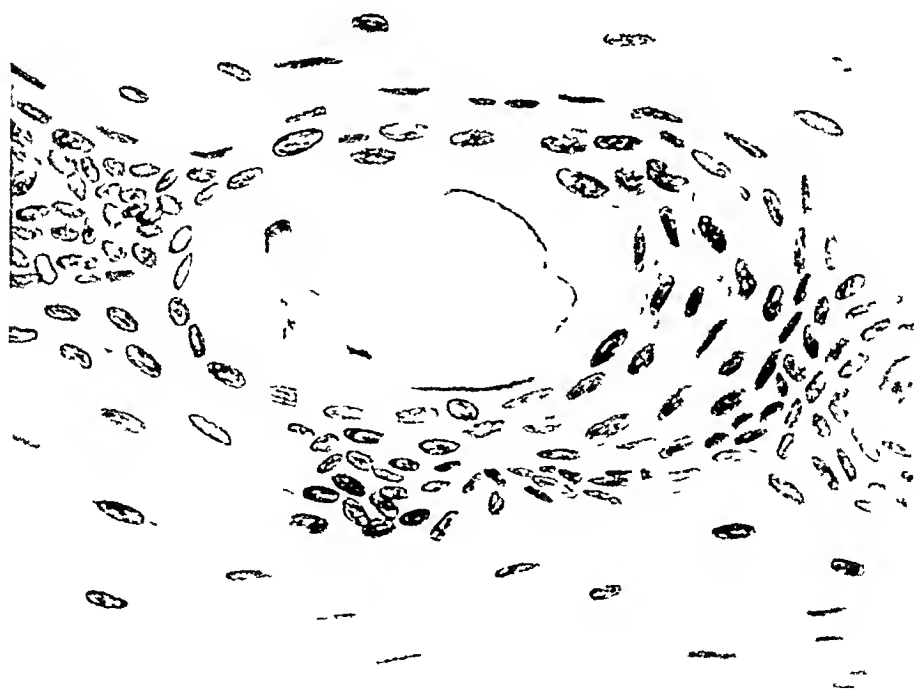


FIG. 2—Case VI Detail from one of the epithelial alveoli showing prickly cells and fibrilla in the epithelial cells. Kromayer's modification of Weigert's fibrin stain.

PLATE VI

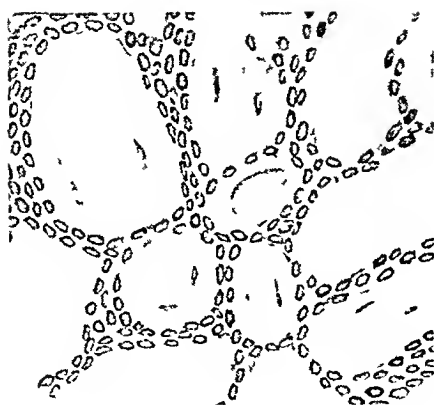


FIG. 1—Case \\\V First recurrence showing alveolar arrangement of the cells of the tumor



FIG. 2—Case \\\V Second recurrence



FIG. 3—Case \\\V Third recurrence with approach to an indifferent type resembling sarcoma. Small connective tissue spindle cells can be seen lying between the cells of the tumor

PLATE VII

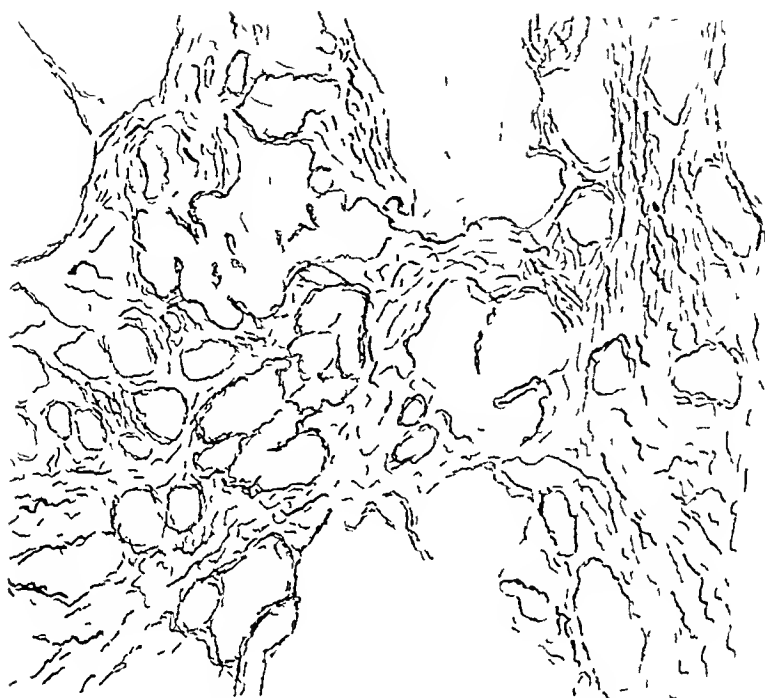


FIG 1—Case LVIII Elastic tissue net-work stained by Weigert's method

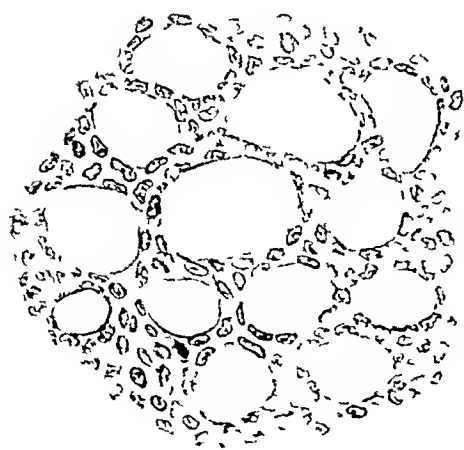


FIG 2—Case LVIII Alveoli filled with colloid material



FIG 3—Case XXXIV Alveoli filled with mucus

PLATE VIII



FIG 1—Case XLV In this portion of the growth the parenchyma is more abundant than the stroma, which remains as a small hyaline layer along the course of the blood vessels

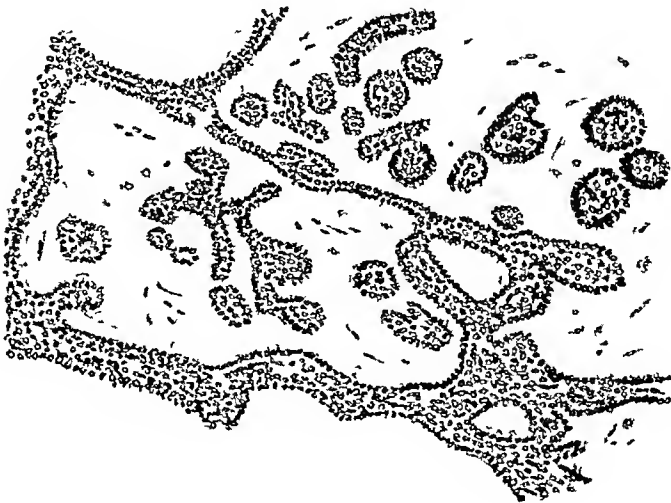


FIG 2—Case I IX Portion of tumor with a large amount of mucous degeneration in the stroma

noma which appears to be due to a large production of mucus crowding the cells of the tumor into strands. No flat epithelial cells with spines were found in the growth, which is chiefly interesting for its peculiar morphology, the transition between the endothelial portions and those resembling carcinoma being quite gradual (Plate VIII, Fig 2)

[TO BE CONTINUED]

EXCISION OF TUBERCULOUS MASS FROM LIVER

BY ROBERT R. ROME,

OF MINNEAPOLIS, MINN.,

Professor of Gynecology in the University of Minnesota

THE patient, Mrs G, aged forty-two years, has never been seriously ill, but has been bilious all her life. Her father was strong and hardy, her mother suffered from some obscure liver trouble.

About the middle of August, 1902, she was suddenly taken with a severe pain in the right lumbar region, lasting about twenty-four hours. Since then her side has been painful. She experienced a difficulty in breathing, which difficulty increased until the breathing became very shallow on that side. She favored the right side, because there seemed to be a pulling pain, and she could neither sleep nor rest on that side.

In November following I was called to see her. I found her supporting her right side with hand placed over sore spot. When walking, she would bend somewhat to the right and stoop forward. Bimanual pelvic examination revealed nothing abnormal.

Abdominal palpation elicited an enlargement at a point midway between the cartilage of the tenth rib and the crest of the ilium, that is, in the centre of the right lumbar section anteriorly.

The enlargement was sensitive. I could not detect fluctuation. It was decided to try medicinal treatment for a month. At the end of this time her condition was no better, and she decided to be operated for the relief of her trouble.

On December 4 she entered the hospital, and on the following morning she was operated. An incision was made over the site of the tumor parallel to the outer fibres of the rectus muscle. Through this incision the appendix was located, and its chronic inflammatory condition called for its removal.

The gall-bladder was found contracted and retracted, no calculi could be detected. Directing search by the aid of the sense of touch along the edge of the liver, it was found that two and one-half inches of intestine were adhered to the liver. After separating the adhesions and freeing the bowel, further

exploration revealed a tumor in the lower right lobe of the liver. The surface of the liver corresponding to the tumor was firmly adhered to the parietal peritoneum. After freeing these adhesions, it was apparent that the section in which the tumor was situated could be removed in the shape of a wedge or triangle. This was mentally outlined, and heavy catgut sutures were introduced, beginning at the apex of the triangle and passed through the thickness of the lobe, the needle was reinserted and brought out opposite the first free end and left untied.

Sutures were introduced in this manner half an inch apart and half an inch from the margin of the triangle. After inserting a sufficient number of sutures, the wedge containing the growth was cut away with scissors, and the cut surfaces of the liver immediately brought together and the sutures tied. Approximating the surfaces in this way promptly checked the hæmorrhage. The size of the tumor removed was that of a goose-egg.

The abdominal incision was closed without drainage. There was some oozing of serum at the lower angle of the wound on the fourth day. The incision healed kindly and firmly, and the patient left the hospital in four weeks. She reports every month, and always with the same happy remark, "I am feeling better and stronger than I have for ten years." The difficulty in breathing disappeared almost immediately after the operation. She can now breathe deeply without any pain or discomfort. Slides were mounted by Drs. Westbrook and Ulrich and a diagnosis of tubercle made. The surface and substance of the liver were smooth and no nodules could be detected.

Dr. Keen, in the *ANNALS OF SURGERY*, gives a summary of the surgical conditions of the liver, and mentions the following tumors: Herniated left lobe five cases, syphiloma twelve cases, carcinoma, seventeen cases, angiofibroma, one case, cavernoma one case, endothelioma one case, angioma four cases, adenoma, seven cases, sarcoma, five cases, cystoma, one case, small calculi one case, hydatid cysts twenty cases.

The case I have just reported adds another tumor to the above list and for that reason alone I deem it worth while recording.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 14, 1903

The President, LUCIUS W HOTCHKISS, M D, in the Chair

GUNSHOT WOUND OF THE ABDOMEN, WITH PENETRATION OF THE STOMACH, GALL-BLADDER, AND LIVER

DR GEORGE E BREWER reported the case of a boy, sixteen years old, who was admitted to Roosevelt Hospital in July last. He stated that one hour before, while standing on the street corner, he heard the report of a pistol, and experienced a slight stinging sensation in the epigastric region. A few minutes later, feeling faint, he sat down on the curb. Some bystanders went to his assistance, and they found his clothes saturated with blood. He was immediately admitted to the hospital, where, upon examination, a small bullet wound was found one inch to the left and one inch above the umbilicus. The abdominal walls were rigid. There was generalized pain in the upper third of the abdomen, with tenderness on pressure in the immediate vicinity of the wound. The temperature was normal, the pulse 120 and of fair quality. The patient was exceedingly restless and apprehensive. He was immediately prepared for operation, and, under ether anæsthesia, a longitudinal incision was made in the median line, extending from a point one inch below the ensiform to a point one inch below the umbilicus. As soon as the peritoneum was opened a considerable amount of blood issued from the wound. The stomach was somewhat distended, partly with undigested food and partly with gas. There were two wounds in the anterior surface,—one at the junction of the middle and outer third, the

other near the pylorus. A small amount of fluid issued from these wounds, which, however, were partly sealed by prolapse of the mucous membrane. This prevented extensive extravasation which otherwise would have occurred. Further search revealed a wound of the gall-bladder, from which bile exuded in large quantities. The course of the bullet was traced in the substance of the liver through a large rent torn at the junction of the gall-bladder with the quadrate lobe. At the bottom of this rent a 32-caliber bullet was found and easily extracted. Further examination revealed a considerable amount of clotted and fluid blood in the pelvis and on either side in the neighborhood of the ascending and descending colon. The incision was immediately enlarged and the entire alimentary canal from the stomach to the rectum was thoroughly examined. The posterior wall of the stomach was explored and a rent was found in the transverse mesocolon. The stomach wounds were closed by continuous Lembert sutures. The wound in the gall-bladder was closed with some difficulty, owing to its ragged nature, and to the fact that it was situated near the junction of the gall-bladder and wounded liver. The blood-clots were thoroughly removed, and the entire peritoneal cavity was irrigated with a large amount of sterile salt solution. The parietal wound was closed with through-and-through silkworm-gut sutures and the dressings were applied. The patient did well for two days, when there occurred a sharp rise of temperature to 104.5° F, with a corresponding increase in the pulse-rate. He complained of intense pain in the abdomen, and he was exceedingly restless. On examination, the abdomen was found to be flat but there was general tenderness and well-marked muscular rigidity. Believing that a spreading peritoneal infection was present, the abdomen was reopened under chloroform anaesthesia. As soon as the peritoneum was incised, a large amount of fluid bile issued from the wound. There was however no sign of peritonitis. The wound in the stomach was explored and found to be normal. The wound in the gall-bladder was apparently tight, yet there was an extensive leakage of bile from the liver wound. This was tightly packed with gauze, the cavity thoroughly flushed with salt solution and the wound was partly closed with generous drainage. The patient thereafter made an uninterrupted recovery.

GANGRENOUS APPENDICITIS WITH EXTENSIVE RETRO-COLIC ABSCESS

DR GEORGE E BREWER presented a man, twenty-seven years old, who had been admitted to Roosevelt Hospital in August last. He had been ill for ten days, the attack beginning with abdominal pain, nausea, and vomiting. There was some elevation of temperature, and a diagnosis of catarrhal appendicitis was made by his attending physician. As the symptoms improved after the first twenty-four hours, he was treated conservatively in the hope that he would recover from the attack and submit to an operation for the removal of the appendix in the interval. From time to time during the following eight days he had recurrences of pain and more or less elevation of temperature. There was never, however, any marked tenderness or muscular rigidity. When he was first seen by the speaker, the temperature was 101° F, the pulse about 90, and the patient complained only of slight discomfort in the right iliac region. On examination there was moderate rigidity over the lower half of the right rectus muscle. There was tenderness on deep pressure, but no palpable tumor. Examination of the blood revealed a leucocytosis of 16,000. He was immediately prepared for operation, and, under ether anæsthesia, an incision was made from along the outer border of the right rectus muscle. The abdominal wall was exceedingly thick, and the incision was extended until an opening six or seven inches in length was obtained. Through this a dense induration was felt beneath the cæcum and extending well up towards the kidney. Upon separating the adhesions a large abscess cavity was found containing nearly a pint of foul pus. The gangrenous stump of the appendix was found, which was densely infiltrated, as was the surrounding cæcal wall. Search for distal extremity of the appendix in the large retroperitoneal cavity was carried out with considerable difficulty, owing chiefly to the fact that the patient's condition became critical from the large amount of ether it was necessary to administer. After searching at least thirty minutes a small gangrenous mass was found and removed, this proved to be the separated appendix with a considerable portion of its mesentery. The wound was thoroughly disinfected and the abdominal incision partly united, two cigarette drains being left, one in the abscess cavity, the other in the region of the pelvis. The patient did well for

two or three days following the operation, but the drainage from this large cavity was never satisfactory, and at the end of five days the patient was again anæsthetized and a counteropening made in the loin. The large drainage tube passed from the abdominal incision through the abscess cavity beneath the colon, emerging from the wound in the flank. By means of this arrangement the cavity was thoroughly flushed with large volumes of saline solution, and at the end of five weeks the tube was removed, and only a few strands of silk allowed to remain. The patient made a satisfactory but slow recovery, and was discharged six weeks from the date of operation.

COMMON DUCT STONE WITHOUT CHARACTERISTIC SYMPTOMS

DR GEORGE E. BREWER presented a woman, twenty-two years old, who had been admitted to Roosevelt Hospital during the summer. During the past four years she had complained of occasional attacks of indefinite abdominal pain and, occasionally with them, slight jaundice. Four months ago she had an attack which was quite severe and accompanied by a marked jaundice, which lasted four or five days, gradually subsiding. Since then she had had more or less discomfort in the upper right quadrant of the abdomen, but no acute pain, fever or jaundice. Abdominal examination was absolutely negative, with the exception of slight tenderness on deep pressure over the gall-bladder region. There was no leucocytosis. A diagnosis of cholelithiasis was made. An incision was made under ether anæsthesia along the outer border of the right rectus muscle. The gall-bladder was found to be normal and free from calculi, as was the cystic duct. Along the free border of the gastro-hepatic omentum a hard, movable body was palpated in the common duct. This was readily brought to the surface of the wound. After clearing the duct a longitudinal incision was made through which a single round calculus was removed. A probe passed readily from the common duct into the duodenum. The common duct wound was closed by the Mayo method and a small strip of gauze was left leading into the duct wound. The abdomen was partly closed the drain being allowed to remain in place twelve hours after which the wound promptly closed and an uninterrupted recovery followed.

COMMON DUCT STONE WITH ACUTE SEPTIC CHOLANGITIS

DR GEORGE E BREWER presented a male, fifty-two years old, who had complained for several years of characteristic gall-stone colic. Ten years ago he was jaundiced. The speaker first saw him during the winter of 1902, when he was moderately jaundiced and complained of occasional attacks of pain in the upper right quadrant of the abdomen, which were accompanied by chills and fever. The gall-bladder region was tender, but no tumor could be palpated. A diagnosis of common duct stone was made and an operation advised but refused, the patient then disappearing from observation. One year later he was again seen in consultation. He was deeply jaundiced, and complained of moderate pain in the gall-bladder region, which frequently became worse. With this increase of pain there followed chills, fever, and sweating. There was a moderate leucocytosis, but no plasmodia were found in the blood. Under ether anæsthesia an incision eight inches long was made over the right rectus muscle. The gall-bladder was thickened and contained thirty-five large and small stones and turbid bile. Two stones were found in the common duct, each the size of a small hazel-nut. Removing these the patency of the duct was re-established by means of a probe passed into the duodenum, and the hepatic duct was drained by the Mayo method. The stones were next removed from the gall-bladder, which was then drained. The abdominal wound was partly closed, room being left for the gall-bladder and duct drains. For ten days or two weeks the temperature remained elevated, and there was an abundant flow of bile from the wound. At the end of the second week all drainage was removed. The gall-bladder wound closed promptly, but there remained considerable leakage from the duct. Ten days after operation bile appeared in the stools, and about the second week the jaundice began to disappear. Six weeks after operation the wound closed and the jaundice had practically disappeared. The patient had been in perfect health since.

GUNSHOT WOUND OF THE FACE

DR HOWARD LILIENTHAL presented a boy, fifteen years old, who four weeks before had been accidentally wounded by a bullet

fired from a 38-caliber bull-dog revolver at a distance of about six feet. The bullet entered the left cheek at a point over the root of the first bicuspid tooth. It emerged through the left auricle, just close to the base of the mastoid process at a level fully one-quarter of an inch above the auditory canal. It did not perforate or injure the mucous membrane of the mouth nor did it perforate or injure the walls of the auditory canal. The case had been seen by a neighboring physician, who had packed both wounds and applied a firm dressing. About one hour later Dr. Lilienthal removed the packing from the posterior wound and evacuated several drachms of blood. The packing was not removed from the anterior wound. A firm bandage was applied over a dry dressing. The recovery was absolutely uneventful with the exception of some limitation of motion of the lower jaw. He presented the case as an illustration of the remarkable course sometimes taken by projectiles of this kind. It was surprising that, with so large a bullet, no laceration of the mucous membrane of the mouth had occurred, and also that, although the auditory canal was in the direct path of the bullet, it was not injured. He believed that in case of slow-going projectiles, such as a bullet from a bull-dog or smooth-bore revolver, the cartilage of the auditory canal had been pushed up out of the way of the passing ball.

FRACTURE OF THE FEMUR, WITH SUBSEQUENT SPONTANEOUS REFRACTURE

DR. FRED KAMMERER presented a patient who some years ago, had sustained a fracture at the junction of the middle and lower third of the left femur. The case had run the usual course, resulting in firm union and restoration of the function of the limb. Last May, after lifting a heavy load, he felt a pain in the upper part of the limb, and since then an angular deformity had been gradually developing at this point accompanied by some enlargement of bone. At the present day the patient presented the following appearance. The left thigh was markedly curved with outward convexity, the most prominent point of which was situated between the upper and middle third. At this point the bone appeared to have about twice its normal thickness. A distinct groove, running in a transverse direction, was easily felt

through the skin, and evidently marked a spontaneous, partial fracture. This was corroborated by the X-ray picture. The picture furthermore showed marked changes in the medullary cavity of the bone, the space evidently being occupied by some foreign substance. The question arises as to the nature of the growth within the medullary cavity, which had caused a spontaneous, partial fracture. Syphilis could be excluded, as there was no specific history, and the exhibition of antisyphilitic remedies had had no effect. A sarcoma was not probable, as the growth had been so slow. Slowly growing tumors had been described in medical literature (chondromata, fibromata), but the speaker had had no experience with them. He presented the case in the hope that a discussion might bring out points to clear up the diagnosis.

CANCER OF THE PYLORUS

DR FRED KAMMERER presented a man, of about forty years, on whom he had operated for cancer of the pylorus. When first seen last February an intra-abdominal tumor could be easily made out, but the condition of the patient was such that a posterior gastro-enterostomy only could be considered. The hæmoglobin had been reduced to 33 per cent of the normal. The operation was done and the patient recovered, passing the Murphy button at the end of about two weeks. Eight weeks later, the hæmoglobin having increased to 45 per cent, the growth was excised and the ends of the incision closed by suture. The patient did well. His weight at once increased about forty pounds, and the blood contained about 65 per cent hæmoglobin. The speaker said that a primary gastro-enterostomy with subsequent excision of a cancerous tumor was not the operation of choice. He had attempted it several times, and found that the conditions in the abdomen after the primary operation changed so much that secondary excision generally became impossible, owing to adhesions. Even in this case, where the tumor had been movable in the first instance, the secondary operation proved to be very difficult. The case showed, however, what could occasionally be accomplished, and he emphasized the importance of early exploratory laparotomy in cases of suspected cancer of the stomach.

CHOLECYSTOTOMY

DR IRVING S HAYNES presented a woman, fifty years of age, who was admitted into the Harlem Hospital, November 1, 1902, with the history that nine weeks before she began to suffer from acute pain in the right hypochondriac region, with occasional vomiting. Her condition became gradually more aggravated and deep jaundice developed. When admitted, the icterus was extreme, temperature, 99.2° F, pulse, 98, respirations, 30. November 2, through an incision parallel with the costal arch, the gall-bladder was exposed, after dividing extensive adhesions between liver and omentum. The gall-bladder was small and firmly contracted down upon a mass of calculi. These were removed through an incision in the gall-bladder, to which a rubber drainage tube was tied by a purse-string ligature. Adhesions were dense and matted everything together, and the calculus causing the trouble could not be located without a systematic search, which the patient's condition did not justify. Therefore the gall-bladder and drainage tube were surrounded with iodoform gauze and brought up at the inner angle of the wound, and the remainder of the incision closed with through-and-through silkworm-gut sutures. Under free stimulation and normal salt solution enemas, one quart every four hours, the patient rallied. No bile had escaped from the incised gall-bladder at the time of the operation, but within twenty-four hours the dressings became stained with it, and during the next day twelve ounces of bile were collected, and about a pint every day thereafter for nearly a month. The urine cleared up rapidly and the icterus gradually disappeared. Bile did not appear in the faeces until after the fifth day, when a calculus was passed by the patient (but not saved by the night attendant), though most of this excretion was discharged through the tube until towards the last of the month, when it was removed.

The patient was discharged December 20. The biliary discharge from the fistula was intermittent, but finally ceased in February. The fistula, however, did not close permanently until the last of July. The case was presented to illustrate complications present in cholelithiasis of long duration. There were dense and universal adhesions, obliterating all the normal anatomical landmarks, and a small, thick, contracted gall-bladder filled with

calculi The operation was incomplete from a theoretical standpoint, owing to the precarious condition of the subject, which contraindicated any radical procedure The cystic duct was not patent at the operation, and the common bile duct was left occluded Nature stepped in and perfected a complete cure by forcing open the cystic duct and discharging the common duct stone into the intestine This emphasizes the opinion that, although choledochotomy and cholecystectomy are the theoretical and proper procedures to be carried out in common duct obstruction, still, when it is a question of our patient dying on the table under the more radical procedure, or being sent away alive and nature given help by a simple cholecystostomy, surely the latter alternative is to be preferred

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, October 5, 1903

DE FOREST WILLARD, M D in the Chair

THREE CASES OF PERFORATED GASTRIC ULCER AND ONE CASE OF PERFORATED DUODENAL ULCER

DR JOHN H GIBBON reported these cases, all of them having been operated upon during the present year

CASE I—A healthy-looking young man, eighteen years of age, was sent into the Bryn Mawr Hospital, January 12, 1903, by Dr T F Branson, of Rosemont, and operated upon on January 13, 1903. The patient had been well except for some gastric discomfort, until the day of admission, when he was suddenly seized with severe abdominal pain. The sudden onset of pain occurred at 5 30 P M. Dr Branson saw the patient at 9 30 P M, and Dr Gibbon operated at 9 30 the next morning. When the abdomen was opened considerable flocculent fluid was found and the pelvis filled with it. The appendix was long, slightly adherent, and considerably inflamed. There was, however, no lymph about it, and it was not in a sufficiently bad condition to have been the cause of the general inflammation. The ileum was examined and found normal. Exploration was then carried up the colon, and the hepatic flexure with the omentum in its neighborhood was found covered with lymph. The incision was extended to the costal border and the duodenum found to be covered with lymph. When a portion of this was removed, a perforation into which a duck-shot could have been placed was found in the first portion of the duodenum. The perforation was inverted with difficulty because of the friability of the tissue sur-

rounding it. However, three sutures deeply placed inverted it. The cavity was thoroughly irrigated with salt solution. Iodoform gauze was packed about the duodenum and hepatic flexure of the colon. The body of the stomach appeared normal. A gauze drain was then introduced into the pelvic cavity and the wound closed in layers. The patient was in an extremely bad condition during the latter part of the operation, requiring the administration of oxygen. He, however, recovered promptly, and seemed in good condition a short time after the operation. The wound became infected and necessitated the removal of a number of the sutures. The gauze packing was gradually removed and the wound ultimately closed. The patient was fed by the rectum for three weeks, receiving nothing by the mouth excepting small quantities of water. An exception to this diet, however, occurred about two weeks after the operation, when he obtained and ate two and a half sticks of peppermint candy. This, however, produced no trouble, and he was discharged on February 27, 1903. After the operation it was revealed that the patient had had attacks of pain in the abdomen, but never sufficient to require a medical attendant. He suffered from pneumonia one year before operation, had never had typhoid fever, and had never been burned. He has been seen a number of times since his operation and has been perfectly well. He eats everything and suffers no discomfort. He has no hernia.

The interesting points in this case are the fact that there was nothing in the patient's previous history which could possibly indicate a duodenal ulcer, the attacks of pain which have been spoken of were believed to have been due to the appendix. He had never had attacks of vomiting nor had he ever passed blood by the bowel. His pain and rigidity were present to a marked degree over the lower half of the abdomen, but more especially on the right side, and therefore the diagnosis of a perforative appendicitis seemed the most likely one. Another interesting point in the case is the length of time which the patient was kept upon rectal feeding. The rectal enemata consisted entirely of malted milk, which was suggested by Dr. Walter Chrystie, who had found it to be well retained and non-irritative.

CASE II—A rather emaciated man of about fifty years, seen in consultation with Drs. Patrick and Sharpless, of West Chester,

Pennsylvania This patient had for several years been under the care of Dr Patrick, who had treated him for gastric trouble On Friday, April 6, 1903, at three o'clock, the patient, in lifting a buggy, was suddenly seized with excruciating pain in the upper part of the abdomen Dr Patrick did not see him until late the same evening, when he was somewhat more comfortable, the result of a hypodermic injection of morphia which had been given Dr Sharpless saw the patient with Dr Patrick, and agreed in the diagnosis of perforated gastric ulcer The patient's family, however, would not consent to his removal to a hospital or to a surgeon seeing him until the afternoon following the perforation He was seen by Dr Gibbon first at ten o'clock on Saturday evening, thirty-three hours after the perforation had occurred At this time he presented all the symptoms of a general peritonitis, the abdomen was distended, rigid, and painful, especially over the upper portion, the temperature had risen to about 101° F and the pulse was 130 and weak The patient was sweating and his facial expression was that of peritonitis Two hours were consumed in obtaining consent for the operation from the patient's family and in removing him to the West Chester Hospital, which was but a short distance from his home The operation was performed at midnight When the abdomen was opened, a large quantity of yellowish fluid escaped with considerable gas A large perforation was readily found in the anterior wall of the stomach at the greater curvature near the pylorus The perforation was sufficiently large to admit the tip of the little finger Because of its size the perforation was closed with considerable difficulty with catgut sutures The stomach and the liver in its neighborhood were covered with thick lymph After the closure of the perforation a second opening was made above the pubes and the pelvic cavity found to contain a large amount of fluid The whole abdominal cavity was thoroughly irrigated with salt solution In spite of stimulation, the patient's condition on the table became extremely bad Gauze drainage was introduced into the pelvis and down to the site of perforation Immediately after the operation a quart of salt solution was introduced into the patient's circulation After the operation consciousness was promptly regained, and he was quite comfortable for several hours In spite of stimulation, however, he died eleven hours after operation

CASE III —An anæmic girl of seventeen years was sent into the Bryn Mawr Hospital by Dr George MacLeod on the first of May, 1903, and was operated upon the same day four hours after admission, about seven hours after Dr MacLeod saw her. She was taken ill with pain in the abdomen about thirty-six hours before admission, but this did not become severe until about eight hours before admission, when she was greatly collapsed. Upon her admission the abdomen was slightly distended, and there was exquisite tenderness on the left side, and the left rectus muscle was absolutely rigid. It was stated that a mass could be felt in the pelvis by rectal examination. The patient's temperature was 100° F and pulse 116. No history of previous gastric symptoms could be elicited, because, however, of the suddenness of the attack and the localized point of tenderness on the left side near the umbilicus the reporter concluded that he had probably to do with a perforated gastric ulcer. The abdomen was opened below the umbilicus and the pelvis found to contain a quantity of dark yellow fluid containing flakes of lymph. The omentum above this incision was found adherent to the abdominal wall, therefore a second opening was made in a median line above the umbilicus. A perforation was found in the anterior wall of the stomach near the pylorus and lesser curvature. It was about one-quarter of an inch wide and three-eighths of an inch long. It was closed without difficulty with catgut sutures. The extravasation of fluid had been so extensive in this case that all of the small intestine was removed from the abdominal cavity and a most thorough irrigation with hot solution performed. A plain gauze drain was introduced into the pelvis and several iodoform gauze drains placed in the upper part of the upper wound, one being put directly over the point of perforation. The patient's condition on the table was bad, but she responded promptly to stimulation. The after-treatment was the same as in the first case, and the patient did well for about two weeks, when she showed some symptoms of obstruction of the bowel, which were accompanied by a rise in temperature and considerable abdominal pain. These symptoms progressed until it was quite evident that to relieve them the abdomen must again be opened. At this time, the seventeenth day after the first operation, the upper wound had practically healed, but there was still some discharge of pus from the lower wound. The gauze drain at this time did not extend deeply. The patient was anæ-

thetized and the lower wound reopened. The small intestine was found matted together in a number of places, but in one place there was a distinct kink which might readily have produced all the symptoms of obstruction. In addition to this condition, however, it was found that the lower part of the pelvis was filled with foul pus. After liberating the adherent cavity and thoroughly irrigating the pelvic cavity drainage was introduced and the patient returned to bed. After the operation she improved somewhat, but died from sepsis on the seventh day after the second operation and the twenty-fourth day after the first operation.

This case was one of subacute perforation with the discharge of the gastric contents into the pelvis, and, but for the complication which arose two weeks after the operation, the patient would have recovered, and this complication was the result solely of failure to reintroduce the pelvic packing sufficiently deep to keep up drainage. It is often difficult to reintroduce the packing as deep as it ought to go, and surgeons are too frequently content to get it simply within the peritoneal cavity.

CASE IV — This patient, a man forty-five years of age, was admitted to the Pennsylvania Hospital on October 1, 1903, and was operated upon immediately. He had suffered for five years from what was supposed to be a duodenal ulcer, he was under the care of several capable men who carried out a rigid treatment. Previous to his admission he had been in bed for a number of weeks on rectal feeding, but during the past week has been allowed soft diet. He had never vomited blood until recently, but had vomited dark material, and melæna had been marked. At six o'clock on the morning of the day of his admission to the hospital, after a comfortable night, he was suddenly seized with severe pain in the epigastrium, accompanied by marked rigidity but no vomiting. Between seven and eight o'clock he was given two one-quarter of a grain doses of morphia hypodermically and then brought to the Pennsylvania Hospital from his home in Moorestown, New Jersey. When first seen by Dr. Gibbon at 2 P. M., his pulse was 112, respiration 24 and entirely costal, and temperature about normal. Soon after the onset of pain in the early morning his temperature was subnormal. His facial expression was bad, though he was not sweating. The abdominal wall was rigid, especially on the right side, in spite of the morphia which he had received. He was unable to pass his urine, though

he had no pain in the lower portion of his stomach. There was a point of tenderness in the epigastrium. When the abdomen was opened through the right rectus muscle a quantity of yellowish fluid containing small flakes of lymph escaped. The gastrocolic omentum was slightly adherent on the right side, the great omentum, however, was entirely free excepting over the right kidney, where it apparently had been adherent for a long time. The duodenum was quite free, and there was no evidence of ulceration in it. On the anterior wall of the stomach, however, about one and a half inches or two inches from the pylorus, and just bordering on the lesser curvature, there was an area covered with lymph, which was removed and two points of perforation about the size of a head of a pin discovered. The lesser omentum was extensively adherent around the ulcer. Because of the situation of the ulcer exactly at the lesser curvature, it was difficult to close it, and in doing so the operator was obliged to utilize the lesser omentum, sewing it firmly to the gastric wall beyond the perforation. The abdominal cavity was then irrigated throughout, a small suprapubic opening being made and a glass drainage tube introduced to the depth of the pelvis. A large gauze drain was placed over the point of perforation and the upper wound partially closed. The lower wound was drained with a glass tube, into which was passed a gauze wick. The operation required thirty minutes, and the patient stood it very well. He was anæsthetized first with chloride of ethyl, which was followed by ether. At the end of the operation his pulse was 120, his temperature a little above the normal, and he was in fairly good general condition. It seemed evident, from the appearance of the adhesions about the ulcer, that an earlier perforation had been prevented by the adherence of omentum, and that with the progression of the ulceration the omentum proved an insufficient control. It seemed wise to do a thorough irrigation of the abdominal cavity because there was considerable free fluid, and the pelvis was drained because a number of pieces of lymph passed up through the tube during the irrigation.

October 10—Tube has been removed from pelvis and gauze drain in upper wound changed twice. Temperature has been normal for a number of days and there has not been a single bad symptom since operation. The rectal feeding continues satisfactory, and the patient bids fair to make a satisfactory recovery.

DR WILLIAM L RODMAN said that gastro-enterostomy is hardly radical enough for the treatment of non-perforating gastric ulcer. It is not certain that it will relieve hæmorrhage, it does not remove the lesion, it does not enable the surgeon to determine if there be more than one ulcer, and it does not get rid of cicatrices which later on may undergo malignant degeneration. According to the best authorities at least 6 per cent of gastric ulcers terminate in carcinoma. The frequency of perforation, hæmorrhage, and other complications of ulcer, many of them occurring most unexpectedly, would make it seem wise in the future to excise the ulcer-bearing area before such complications occur. This can be done without great difficulty or risk of danger, as in probably 80 per cent of all cases the ulcers are near the pylorus and the lesser curvature of the stomach, and can easily be excised at one time. The mortality from this operation should not be more than from 5 to 10 per cent, while the mortality from gastric ulcers treated by medical means is known to be much higher, some writers placing it as high as 50 per cent. Dr Rodman closed by asserting his belief that the future treatment of gastric ulcer should be largely operative, and consists in excision of the ulcer-bearing area instead of simply the ulcer itself. In his advocacy of this method at recent meetings of national societies, he has found that similar views are held by many eminent surgeons.

DR MORRIS J LEWIS stated that he had seen in consultation with Dr J A Scott, one year ago, the fourth case reported by Dr Gibbon towards the close of the patient's fourth attack. At this time the symptoms, it was thought, pointed rather more to duodenal than to gastric ulcer. There had been epigastric distress coming on some time after eating, and blood in the evacuations, with some nausea, but without vomiting. During the summer the patient improved greatly and gained fifty pounds in weight. One month ago, symptoms of trouble reappeared, there was pain two or three hours after eating, and vomiting of blood. Under rectal feeding the symptoms ameliorated, but one week after recommencing very careful feeding by the stomach the patient awoke with excruciating pain in the left shoulder-blade, which soon transferred itself to the cardiac region and then to the epigastrium, when the diagnosis of perforation was made and the patient brought to the hospital.

Pain in the scapular region as a symptom of gastric perforation is unusual, and worth remembering

DR J ALISON SCOTT said that the physical signs in the case referred to by Dr Lewis presented some interesting points in diagnosis, it being distinctly an atypical case, if one is to believe text-book statements. It is stated that gastric ulcer is found in cases of extreme hyperacidity, and that the result of an old ulcer is usually puckering of the tissues, resulting in more or less obstruction of the pylorus. Hence we should expect to find a dilated stomach and hyperacidity of its contents. In the case under consideration there was not only the absence of hyperacidity, but there was actually anacidity, and the patient's stomach was absolutely normal in size. These points, in conjunction with the facts that there was no vomiting, and that the blood in the stools was fully digested and recognized only by chemical tests, made the diagnosis of gastric ulcer in the early stages of the case extremely difficult. The history during the month preceding perforation, although he did not then see the case, was more that of the typical symptoms of gastric ulcer. Dr Scott believes that cases of gastric ulcer are not so common in this country as in England. In a somewhat extensive hospital experience he has not seen more than ten to fifteen cases, and has never in his hospital or private practice been in charge of a case when perforation occurred.

DR ADDINELL HEWSON said that the presence of fluid in the lower right portion of the abdomen, and the consequent rigidity of the abdominal wall in that region as found by Dr Gibbon in his cases, can be explained by the anatomical relations of the involved structures. The attachment of the mesentery extends downward from left to right, and the omentum in its projection downward from the stomach extends more to the left than to the right. The mesentery is attached to the posterior abdominal wall, the intestines occupy the space forward, and the duodenum, under the greater curve of the stomach and the omentum, fills in the interval between. Hence fluid from the perforations in question will first pass downward on the right side. Later it may pass upward and towards the left, but not until the lower right portions of the abdomen are occupied by the fluid which follows the posterior attachment of the mesentery to the parietal peritoneum. When the perforation is on the posterior wall of the stomach, the course would not be the same were it not for the fact that the

mesenteric attachment of the pyloric end is not so long as that of the cardiac end. Even when the fluid comes from a perforation on the ventral wall of the stomach, it is possible for it to take the same direction as when it comes from the duodenum or the pylorus or the posterior wall.

DR FRANCIS T STEWART reported two cases of perforation of the stomach operated upon with recovery of both. The first was that of an apparently healthy boy-tender aged twenty-four years, who had never suffered from indigestion, and who had never vomited blood or passed blood from the bowel. Soon after taking a hearty dinner of lamb chops and peas the patient was seized with severe pain in the epigastric and umbilical regions, and later vomited the materials composing the dinner, but no blood. When seen soon after there was general tenderness and rigidity, but most marked over the right upper quadrant of the abdomen. Liver-dulness was present, and there was no dulness in the flanks. The leucocyte count was 18,000, and within an hour rose to 19,000. Blood-pressure was 235. A diagnosis of perforated gastric ulcer was made and operation performed five hours after its occurrence. A perforation one-eighth inch in diameter was found one-half inch from the pylorus near the greater curvature of the stomach. It was closed with a purse-string suture reinforced by Lembert sutures. A second abdominal incision for drainage was made below the umbilicus. Recovery followed.

The second case was that of a gunshot wound of the stomach in a boy of eleven years, the bullet having entered below the costal arch on the left side. When the patient was seen four hours after the injury there was abdominal rigidity, though neither this nor tenderness was marked, liver-dulness was present, and there was no dulness in the flanks. There was no vomiting. Operation was performed four hours after the injury was received. The bullet had passed through the stomach near the cardiac end. Both wounds were closed by purse-string, reinforced by Lembert sutures, the abdomen closed without drainage, and the bullet removed from where it was lodged immediately beneath the skin of the back. Both patients made uneventful recoveries.

DR GIBBON, in closing, emphasized strongly a point mentioned in his paper namely, the extensive induration of the stomach wall in his fourth case. He referred to the number of cases of supposed gastric cancer, reported as such, in which

gastro-enterostomy has been followed by recovery and apparently by the disappearance of the cancer. These probably have been cases of ulcer with pronounced induration. In the case in question, Dr Gibbon believes that if the induration present had been in the pylorus he would have pronounced it malignant. He recalled the case of a woman upon whom he had operated, and who had a clear history of gastric ulcer some ten or twelve years previous. When he saw the patient she was vomiting, and presented other symptoms of acute obstruction of the pylorus. Operation revealed a mass that was thought to be pyloric carcinoma. The patient was anæmic and in bad general condition, and gastro-enterostomy was performed with the idea of doing a subsequent pylorectomy if the patient's condition improved sufficiently to warrant that operation. She vomited a great deal after the operation, and did not do well for a time, but finally made a good recovery. Her condition now is satisfactory enough to support the hope that the pyloric mass was only an extensive infiltration around an old gastric ulcer.

TWO CASES OF PERFORATION DURING TYPHOID FEVER TREATED BY OPERATION ENDING IN RECOVERY

DR ROBERT G LE CONTE said that in reporting these two cases, and referring to a third one, the three having been operated upon last month at the Pennsylvania Hospital, he did not wish to give the impression that the operative cases of that institution are always successful. Their statistics in this dreaded complication are just as bad as those of other hospitals, and it is simply a coincidence that two cases following each other should have been successful. The third case mentioned occurred in the service of Dr Gibbon, which recovered from the primary operation, but died ten days later from a secondary perforation.

CASE I—J S, hatmaker, Russian Jew, aged thirty-eight years, was admitted to the Pennsylvania Hospital July 21, 1903. Owing to his nationality, it could be learned only that the patient had been ill in bed four weeks with fever. He was evidently suffering from an attack of typhoid fever of moderate severity. On admission his temperature was $102\frac{2}{5}^{\circ}$ F, respirations, 32, pulse 108, regular but weak. Tongue moist, slightly coated, very tremulous, lips covered with sordes, abdomen soft, rounded, no tenderness and no spots. Spleen easily palpable but not tender.

Urine showed faint trace of albumen without casts. The day after admission a Widal test was made, and another five days later, both proving negative. The fever ran a moderate course, and twelve days after admission the temperature touched normal for the first time. The convalescence from this time on was uninterrupted, and the patient left the hospital August 17, fifty-six days after the onset of the attack.

He was readmitted to the medical wards under the care of Dr. Stengel, September 8, 1903, twenty-two days after his discharge from the hospital, complaining that for the past few days he again had fever and felt badly. The temperature was $103\frac{3}{5}^{\circ}$ F, pulse, 112, respirations, 28, tongue coated white, edges and tip red, very tremulous, a few râles posteriorly on the right side of the chest. Spleen enlarged, palpable, and tender, abdomen well rounded, soft, flabby, slightly tender, with a few suspicious rose spots. Urine, slight trace of albumen and a few hyaline and granular casts. A Widal test was suggestive but not positive. For a week the man went through a moderately severe relapse, with quite marked hebetude. He received thirteen baths and fourteen sponges, one alternating with the other when his temperature rose to 102° F or over. On the evening of the 15th of September, the eighth day after admission, he informed the night nurse that he had had pain in the abdomen for the greater part of the day, but that it did not become severe until 7 30 P M. At five o'clock that day his temperature was $101\frac{1}{5}^{\circ}$ F, and at 9 P M it had fallen to $97\frac{4}{5}^{\circ}$, respirations, 24, pulse, 100. At 10 30 the patient broke into a profuse perspiration, with shallow respirations and anxious expression. At this time the temperature was $97\frac{3}{5}^{\circ}$ F, pulse, 140, respirations, 40, abdomen tympanic, rigid, and tender, especially on the right side. A diagnosis of perforation was made, but permission for operation was delayed until friends could be communicated with. At 2 A M, September 16, ether was administered, and a three-inch incision made in the right semilunar line below the umbilicus. This was three hours and a half after the patient showed signs of collapse, six hours and a half after the onset of severe pain, and perhaps fifteen or eighteen hours from the first pain noticed. On opening the abdomen, some cloudy, non-odorous fluid escaped. The cæcum immediately presented. It was brought out of the abdomen and a search for perforation was begun at the ileocæcal valve.

About eight inches from the cæcum a large inflamed Peyer's patch was found in the ileum, with a perforation in the centre about the size of the lead in a pencil. This was invaginated with a running Lembert suture of silk reinforced with three or four interrupted Lembert sutures. No other inflamed areas were discovered on the bowel. The pelvis contained some turbid fluid, but no lymph flakes. The operating table was tilted so that fluids would gravitate to the pelvis and to the right side of the abdomen while the cavity was being irrigated with salt solution. The pelvis was then mopped dry, a rubber tube inserted to the bottom, and five wicks of gauze were run in various directions between the coils of intestine to a distance of two or three inches from the wound. One suture was then passed through the wound and tied to retain the intestines within the abdominal cavity, the remainder of the incision being filled with gauze. Time of operation, thirty minutes. The patient reacted well, and vomited once a small amount of dark brown liquid. Temperature immediately after operation, $98\frac{2}{5}^{\circ}$ F, pulse, 128, respirations, 40. The convalescence was uninterrupted, but movements of the bowels had to be secured by enemata of soap and water. The gauze wicks were removed forty-eight hours after operation and the tube leading to the pelvis on the seventh day. The latter was replaced by a narrow wick of iodoform gauze. The temperature reached normal eight days after operation, and convalescence was uninterrupted. Cultures taken from the peritoneal fluid at the time of operation showed numerous streptococci pyogenes, and also a few streptococci pyogenes aureus.

It will be noted that in this case at the time of his first attack of fever the Widal reaction proved negative, and during the relapse the Widal was only suggestive, and not positive.

CASE II.—A G, Russian laborer, aged twenty-one years, was admitted to the Pennsylvania Hospital August 25, under the care of Dr. Stengel. He had been ill for ten days previously with fever, headache, slight cough, and hebetude. Examination revealed a well-built, well-nourished man, tongue coated, edges and tip red, a few râles in the upper lobe of the right lung, with slightly diminished resonance. Abdomen well-rounded, tympanic, soft, with slight tenderness, and no pain. Spleen enlarged, palpable, and tender. Surface of abdomen and chest showed several rose spots. Urine contained trace of albumen and a few

hyaline casts Widal test positive His temperature shortly after admission was $104\frac{4}{5}^{\circ}$ F, pulse, 104, respirations, 24 Tubing was resorted to each time the temperature reached 102° or over, and in the next six days he received twenty-eight baths At this time, estimated the sixteenth day of the disease, immediately after a bath at 6 P M, he complained of sharp pain in the right side of the abdomen, with rigidity and tenderness There was no vomiting A blood-count an hour later showed 9600 leucocytes Pain and tenderness at this time had increased, and also the rigidity Temperature was 100° F, pulse, 110, respirations, 24 At 11 P M, four and a half hours after the onset of pain, operation was undertaken by Dr Mitchell in the absence of Dr Le Conte Ether was administered, and a three-inch incision made in the right semilunar line below the umbilicus A slight amount of turbid fluid escaped One foot from the cæcum a large necrotic ulcer was seen, with a small perforation about the size of the head of a pin, from which a small amount of gas was escaping Very little lymph was present, and no attempt at walling off The perforation was inverted with two rows of Lembert sutures, abdominal cavity washed out with salt solution, and a gauze wick inserted in the pelvis and another at the site of perforation, wound partially closed with through-and-through silkworm-gut sutures

After operation reaction was good, no vomiting, temperature rose rather rapidly to 104° F and then subsided gradually, so that by the seventh day it reached normal for the first time The abdomen continued soft without distention Bowels moved with enemata Packing was finally removed on the eighth day after operation After the temperature had been normal for ten days there was again a rise, with signs of a relapse of fever This continued for sixteen days, during which time he received thirty-four spongings, when the temperature was 102° F and over Convalescence is now again established

The successful results obtained in these two cases are unquestionably due to the fact that both patients had more or less classical symptoms of perforation The diagnosis having been readily and quickly made, operation speedily followed

In the first case the man said that for some hours he had had abdominal pain This pain must have been slight, for it was not sufficient for one of his race and nationality to speak of it until several hours had passed, then the pain became severe, and

shortly afterwards signs of collapse were present, with subnormal temperature, rapid, weak pulse, rapid respiration, profuse perspiration, and anxious facial expression. From the onset of the symptoms of collapse three hours and a half intervened before operation.

In the second case the first sign of perforation was sharp pain immediately after a tub bath, which was quickly followed by rigidity, tenderness, and a relatively high leucocyte count, a fall in temperature, and a rise in the pulse-rate. From the onset of this pain four hours and a half elapsed before the operation was undertaken. In neither case was there any attempt on nature's part at walling off the perforation from the general peritoneal cavity. In both cases the perforated area seemed to be in contact with the parietal peritoneum. It is known that the parietal peritoneum is very much more sensitive and reacts more quickly to an irritant than the visceral peritoneum, and it may be that in this fact there is a reason why some of the cases immediately present classical symptoms of perforation, while in others the onset is so gradual that the diagnosis cannot be made until the patient is practically beyond operative relief. Given a perforation which is surrounded by coils of intestine or covered by omentum (the least sensitive portions of the peritoneal surface), it might be hours or even days before the inflammation extended to the parietal peritoneum, with the appearance of severe pain, rigidity, and marked tenderness. The reporter had observed—but on this point he was not entirely certain—greater pain, tenderness, and rigidity of the abdominal wall when an inflamed or perforated appendix is in contact with the parietal peritoneum, and that the symptoms are much less marked when such an appendix is surrounded or walled off by intestinal coils. This suggestion was made only as a possible explanation for the slow and gradual onset of symptoms sometimes observed in perforating cases. When a condition of profound toxæmia is present, one would naturally look to this for a masking of the abdominal symptoms.

DR J ALISON SCOTT confessed his inability to diagnose perforation on all occasions. He had made a careful study of many of these cases at the Pennsylvania Hospital, and finds that they do not show any one thing that is diagnostic of perforation. Neither temperature, pulse, nor respiration is constant. Rigidity, pain and the symptom complex are most to be depended upon

Something in the appearance of the patient that can hardly be described is often suggestive. And yet all these points may be demonstrated in a patient and operation reveal no perforation. However, it is better to make this mistake occasionally than to let cases go unrecognized.

DR JOHN H. GIBBON said that he was convinced that perforation of the large bowel is more insidious and presents more difficulty in diagnosis than does a like condition in the small intestine. He cited a case of perforation of the sigmoid in which adhesions had formed. When the abdomen was opened there was escape of gas, but only a small quantity of fluid was present. The perforation was exposed only when the sigmoid was separated from the abdominal wall to which it was adherent. Dr Gibbon said that he felt that local anæsthesia was not so popular in Philadelphia as in some other cities, but it worked very satisfactorily in the above case. The man was very ill and delirious, and he decided to open the abdomen under cocaine and determine if perforation had occurred, and then employ ether if necessary. No pain was complained of until the sigmoid was dragged upon, and then ether was given. A series of seven cases of perforation operated on under local anæsthesia with three recoveries, which is reported by Hays, of Pittsburg, speaks well for this method of anæsthesia. One can trust to cocaine for exploratory incisions if one-fourth grain of morphine be given hypodermically fifteen minutes before operation. If prolonged operation is found necessary after the exploratory incision, ether can be given. Dr Gibbon then discussed the treatment of threatened perforation in cases that are being operated upon. He has lost two patients from secondary perforation,—one on the second, the other on the tenth day after operation for the first perforation. In the first case the second perforation occurred promptly after the first, but in the second it was not suspected until shortly before death. At the operation only one ulcer seemed in imminent danger of perforation, and it was inverted. Autopsy showed that one had perforated which had shown no signs of it at the time of operation ten days before. In the second case an ulcer seemed on the point of perforating, but it was situated so near the ileocæcal valve and the surrounding tissue was so friable that attempts at inversion were unsuccessful. An expedient which will not be again used was then employed. It consisted in wrapping the omentum around the intestine in

such a manner as to cover the weakened area, the enveloping structure being held in place by a gauze pad. Perforation, as stated, occurred on the second day, before sufficient adhesions had formed to prevent the escape of the intestinal contents. Better results would no doubt have been secured had the gauze been placed next to the intestine or had the omentum been sewed to the intestine. One of the latter plans will be adopted in any future similar case.

DR WILLIAM J TAYLOR believes that the mortality in operations for typhoid perforation is in direct proportion to the size of the opening in the bowel. In two cases which he operated upon early, within one and one-half hours after perforation was diagnosed, there were large openings in the intestines and profound infection of the peritoneal cavity. Cases ending in recovery generally have small openings and but a comparatively slight amount of fluid in the belly. This fact urges early operation in cases of perforation.

DR JOHN H JOPSON cited a case corroborating Elsberg's statement that the symptoms of perforation in a child do not differ from those of an adult. He operated upon a child of six years, one of the youngest patients on record, who was admitted to the hospital twenty-four hours after perforation had occurred during the third week of the disease. The child had severe abdominal pain, vomiting, etc., in fact, being sent in as a case of peritonitis. When seen thirty-six hours after perforation the symptoms were typical, differing in no way from those seen in the adult. The child lived three days after operation.

DR WILLIAM L RODMAN agreed with Dr Scott that there was no one characteristic symptom or sign of perforation. He also believed that rigidity and pain, with the addition of a sub-normal temperature, are the most reliable indications. Considering the present difficulty in diagnosing perforation itself, it does not seem that Cushing's suggestion of operating in the pre-perforative stage can be attempted. We must be further along in the matter of diagnosis before doing that, however desirable it may be. When in doubt regarding the presence of perforation, Dr Rodman advises exploratory incision under cocaine. He has used this in two cases, one of which he was sure was hæmorrhage instead of perforation. He operated at the solicitation of two medical colleagues, and found blood in the bowel but no perfora-

tion This finding was confirmed by autopsy, death occurring later from a second hæmorrhage He recovered from the operation, and would have probably recovered but for the second hæmorrhage An interesting feature in this case was that the medical men were misled by the leucocytosis present Dr Rodman emphasized the fact that the sooner we operate in these cases the better are the results Statistics regarding the result of operation are becoming better because surgeons no longer wait for the subsidence of shock As in gunshot wounds of the intestine, we should operate at once and not wait too long He has operated on but one case, and recovery followed, though thirty-seven hours had elapsed since perforation and general peritonitis were marked As to Dr Taylor's statement regarding the size of perforation, the end of a finger could be put in the opening in this case It was true, however, that not a large amount of fluid had escaped, the presence of lymph and the adherent omentum preventing great extravasation into the peritoneal cavity Regarding local anæsthesia, Dr Rodman said that the abdomen can be opened without giving the patient much pain The intestines can be handled quite freely without causing pain, pinching the parietal peritoneum with forceps causing the greatest discomfort He has performed one laparotomy under anæsthesia induced by carbolic acid alone, cocaine not being employed

DR R P McREYNOLDS has operated upon five cases of typhoid perforation, in four the diagnosis was made too late and death resulted from general peritonitis In two cases coming to autopsy the operative result was good, the perforation being entirely closed In one case, when the perforation was closed, the omentum was stitched over the ulcer in order to reinforce, and at the same time to prevent adjacent ulcers from perforating The leucocyte count in these cases was misleading, in the last case it was only 8900, and for this reason we were not urgent enough for immediate operation If we depend upon the leucocyte count alone, we will lose our patients We thought the question of consultation to be an important one If medical men see the case first and then send for the surgeon much valuable time is lost In hospitals it would be better to send for a surgeon as soon as a typhoid fever patient shows any sign of perforation, and if he thinks an operation is indicated go ahead at once without waiting for a consultation

DR FRANCIS T STEWART gave a brief analysis of eight cases of perforation in typhoid fever operated upon by him with two recoveries. Six were males, two females, ages varied from nine to forty-two years, the period of the disease varied from the thirteenth day to the fifth week, the time of operation after perforation was three, twelve, twelve, fourteen, nineteen, and forty-eight hours respectively in six cases, the other two being unknown. The first and one of the last two recovered. Many of the following statistics refer to six cases only, as but little was known of the other two. There was previous abdominal pain in two, none in the others, all had pain when perforation occurred, there was tenderness and rigidity in all, vomiting was absent in five, the temperature fell in one, rose in one, remained unchanged in four, pulse and respiration were accelerated in all, seven had distention and thoracic breathing, liver-dulness and dulness in the flanks were absent in six, the leucocyte count in four cases was respectively four, seven, ten, and eighteen thousand, the perforation in all was within three feet of the ileocæcal valve, the size of the opening varied from that of a pinhead to a quarter-dollar, free fluid was found in the abdomen of each, being clear in one, in only one was there any attempt at walling off the perforation by adhesions, two of the patients had been walking about until the occurrence of perforation, four were admitted as emergency cases, four were in the hospital when perforation occurred, ether was used in seven cases, cocaine in one. Dr Stewart does not agree with Dr Gibbon regarding the use of local anæsthesia in these cases, but prefers ether. Cocaine for exploratory incisions is of value but for treatment is not satisfactory as good work cannot be done upon a frightened, struggling patient. In addition to this point, the abdomen cannot be properly cleansed when only cocaine is employed. Drainage was employed in seven of the eight cases reported, in one the peritoneum seemed normal, drainage was not employed, and the patient recovered, none of the patients had a chill at the time of perforation, the Hippocratic facies was present in six, being absent in the two that recovered, auscultation was negative in seven, peristalsis being present in one of the patients that recovered, the diagnosis of perforation was made in five and the incision made in the right iliac region, the median incision being

used in the others, in which a diagnosis of perforative peritonitis was made

DR JAMES P HUTCHINSON has seen the diagnosis made and operation performed in twenty cases of perforation in typhoid fever. Generally speaking, physicians are not inclined to call a surgeon in these cases as early as the latter would like. In doubtful cases operation should be performed, as those patients not suffering from perforation are not harmed by the exploratory incision. Dr Hutchinson does not agree with Dr Taylor regarding the effect of the size of the opening in the intestine. The peritoneum is more tolerant in patients having typhoid fever than is generally supposed. He believes that there is in every case a small perforation first, and that the opening gradually becomes larger. In some of the cases seen there was reason to believe that as many as four days had elapsed before symptoms became pronounced. He believed that perforation had been present in many cases longer than usually supposed, and during the most of this time the presence of fæcal matter has been withstood. Ether is considered by Dr Hutchinson to be the best anæsthetic. It does not do as much harm as the fright when local anæsthetics are employed. A large part of the time taken by these operations is employed in washing the abdomen, and during this period the ether can practically be dispensed with. In cases of perforation where there is not a large amount of fluid and the infection is distinctly limited, the area should simply be wiped with gauze and not flushed, flushing will carry the infection throughout and make the condition worse.

DR LE CONTE, in closing, referred to the condition mentioned by Dr Gibbon where a considerable area of inflamed bowel is present with a number of suspicious ulcers threatening perforation. In the presence of such a condition he did not believe it wise to invaginate with sutures these suspicious ulcers, or to cover them with omentum, as there was grave danger of their breaking down. He preferred to isolate such areas of the intestine from the general peritoneal cavity with walls of gauze, and to permit the ulcers to perforate if they would do so. A case was cited in which a dozen highly inflamed and thin areas were present in the last two feet of the ileum and in the cæcum, in which this entire area was isolated from the rest of the peritoneum by gauze. Within forty-eight hours some of these ulcers perforated with the

formation of fæcal fistulæ These fistulæ closed spontaneously in three weeks, and the patient recovered without further operative treatment

HERNIA FOLLOWING OPERATION FOR APPENDICITIS

DR WILLIAM J TAYLOR presented a man, aged twenty-six years, always healthy and strong, except for an attack of appendicitis six years before From this he made a complete recovery, and had no symptoms of recurrence until October 2, 1901, when he was seized with acute pain in the right side Two days afterwards he was operated upon, and believes the appendix was removed and no pus was found, as the wound was closed without drainage The sutures were removed on the fifth day, the wound apparently perfectly healed, and he remained in bed about five weeks to insure absolute closure of the wound When he got up he wore a bandage with a pad over the site of the wound

Towards the end of December, or nearly three months after this operation, he first noticed a little bulging at the lower angle of the wound, this gradually increased, in spite of wearing the bandage, until a very distinct and well-developed hernia resulted He had a good deal of pain and discomfort, and for three or four weeks before he was seen by Dr Taylor had almost constant pain When he presented himself, there was a well-developed hernia about the size of the closed fist, which could not be entirely reduced It was directly over the wound, and had dissected under the skin latterly towards the flank An opening in the belly wall about an inch in diameter could be distinctly demonstrated

On January 14, 1902, or fifteen months after the original operation, an incision was made to the outer side of the scar, and the hernial sac exposed An opening was found about an inch in diameter in the belly wall, to this was adherent omentum and bowel, which were both anchored outside of the belly cavity There was an immense number of adhesions everywhere, and the omentum had to be dissected away with great care The hernial sac and its surrounding fibrous tissue were taken away also The edges of the opening were freshened, the layers of the belly wall dissected loose, and three layers of suture were placed in the deeper tissues The wound was then closed by interrupted silkworm-gut sutures, about six strands of silkworm gut intro-

duced in the wound for drainage. The wound came together nicely, but there was a fair amount of tension on the stitches.

In the opinion of Dr. Taylor, undoubtedly at the time of his first operation a stitch had given way, or else the closure of the wound was not sufficiently accurate. The patient says that he vomited excessively after the operation, and a small portion of the omentum was forced out in the incision and caught. Along this path the hernia developed.

The reporter stated that he had seen quite a number of cases of hernia following abdominal operations and had operated upon a number of them. In all instances there has been a portion of omentum, and at times bowel anchored outside of the belly cavity and attached by adhesions to the hernial sac.

This explains the extreme difficulty of complete reduction in most of these cases, and also the discomfort produced by any form of truss or bandage. For this reason he would urge very strongly that operation be done and a definite closure of the opening in the belly wall made in all of these cases. A hernia through the belly wall which gives any discomfort ought not to be allowed to remain for any length of time without an attempt being made to close the opening by operation. The after results in this case were perfect. His recovery was uneventful and uninterrupted.

DR. WILLIAM L. RODMAN cited a case which had been a source of surprise to him. He operated upon a clean case of appendicitis, using the gridiron incision, securing primary union, but the patient returned some time later with a large ventral hernia. Why it occurred is not understood, as the layers were sutured separately with kangaroo tendon and chromicized gut. The patient attributed the hernia to a fall which she received a few weeks after operation. It has been said that hernia cannot occur after the gridiron operation, hence this case is put on record. In many such operations it is the only hernia he has seen where primary union was secured.

DR. ROBERT G. LE CONTE said that in closing an abdominal wound without drainage he always used through-and-through sutures of silkworm gut with catgut to unite the layers of the fascia, and had never had a hernia follow this method of closure. The approximation of the fascia is of much more importance than that of the peritoneum.

NECROSIS OF ENTIRE LOWER JAW

DR ROBERT G LE CONTE exhibited a lower jaw which he had removed that day from a child four and a half years old. Two weeks previously the child was said to have been perfectly well. The trouble began with pain in one of the teeth on the right side of the lower jaw. This was speedily followed by swelling of the right side of the face, fetid breath, discharge from the mouth, and high fever. When seen the child was almost in a typhoid condition, with great swelling of the right side of the face, temperature 104° F, a gangrenous condition of the alveolus, fetid breath, etc. On a hasty examination the case was thought to be one of noma, but after ether had been given it was found that the whole lower jaw was the seat of a fulminating, gangrenous osteitis. The mucous membrane covering the mental portion of the jaw was incised within the mouth, the jaw divided, and each half removed separately with sequestrum forceps by aid of very light traction. The cavity remaining was then curetted and the gangrenous tissue cut away with scissors, hæmorrhage being controlled by iodoform gauze packing. The patient's condition is most serious from systemic sepsis.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, November 2, 1903

The President, E WYLLYS ANDREWS, M D , in the Chair

RESECTION OF THE KNEE FOR TUBERCULOSIS

DR WILLIAM HESSERT exhibited a young man who had been suffering with a tubercular knee since childhood. For many years he had been under treatment by different physicians. His knee was intermittently involved, considerably swollen, and useless, while at other times he was able to get around. About two years ago the knee became considerably worse again and patient was more or less disabled. He was subjected to local and general treatment, including rest, the application of plaster casts, hot-air treatment, etc., all of which were of no avail. A year ago the knee was very much swollen and exquisitely tender. The swelling was fusiform, presenting the classic symptoms of a typical tubercular knee. A typical resection was made, the flap with convexity upward. The patella was sawed transversely, laid up and down, crucial ligaments severed, and a complete arthrectomy was done. The ends of the bones were sawed off about half an inch. There were two foci of necrosis, one in either tuberosity, which had to be scooped out with a sharp spoon. He did not wish to sacrifice any more bone than was necessary. After thoroughly dissecting out all of the tubercular tissue the bones were drilled, a heavy catgut ligature drawn through, and the bones brought together. The capsule was reunited and the skin incision sutured, leaving a small drain of gauze on either side. A cast was applied for three weeks after which it was renewed for another three weeks. While patient was wearing the second cast he was up and around and doing things around the house.

The shortening was a little more than an inch. The result was an excellent example of a knee resection. The young man is very active, walks, runs and climbs stairs with the greatest agility.

UMBILICAL HERNIA

DR. HESSEPT showed a woman upon whom he operated for umbilical hernia from which she had been suffering for nearly twenty years. At first the hernia was small, but of late it had assumed increased proportions. For the last few years it was irreducible. It was about the size of two fists, the pedicle was twelve inches in circumference. The wearing of a large abdominal supporter had caused so much irritation as to induce attacks of cellulitis in and about the sac. Patient was reduced to such a condition that she was almost unable to do any work. The hernia was rather tender, partly tympanitic and partly dull on percussion. A typical Mayo operation was performed.

The wound healed by primary intention and the woman made an excellent recovery. She still wears an abdominal supporter owing to the pendulous condition of the abdomen. The distance from ensiform to pubes was reduced three inches by operation.

APPENDICITIS WITH SEVERE COMPLICATIONS

DR. HESSEPT presented a third case, one of appendicitis. The patient was a woman who had not had a previous attack. She suffered from severe pains in the abdomen, with vomiting and fever for a week but kept on doing her housework. She finally called in a physician on the seventh day after the onset of the attack, because at this time she suddenly had most severe pain in the right iliac fossa radiating all over the abdomen but chiefly focussed in the right iliac region. This was accompanied by vomiting, high fever and collapse. The speaker saw the patient on the seventh day, the case having been referred to him by Dr. W. A. Brerenger. Her pulse at this time was 106, temperature 101° F. and she was in a collapsed condition. The abdomen was tender, nothing definite could be made out except a point of tenderness in the right iliac region a little internal to the anterior superior spine. A diagnosis of perforative appendicitis was made but her condition was such that it was not deemed wise to operate at once.

He therefore instituted the treatment advocated by Ochsner, namely, withholding food, gastric lavage, giving no opiates or cathartics, etc. The patient was much better the next day, in that the pulse had declined to 120 and temperature to 102° F. He then operated and found that the appendix had ruptured, with a concietion in the free peritoneal cavity not far from the appendix. Some free pus around the appendix. The appendix was posterior to the colon, lying on the iliacus muscle, and was removed with difficulty, owing to the shortness of its mesentery. It was removed, and the stump inverted with fine silk suture. Drainage with gauze and rubber tube. After the operation patient left the table in good condition. But for the first week following the operation her temperature did not decline, it ranged from 101° to 103° F. While her general condition had improved, she still had pain, which became localized in the lower lumbar region, so that an examination showed the development of a mass anterior to the kidney and below the liver, and probably behind the colon. On the seventh day after the operation there was a profuse discharge of pus from the original wound, and by making a bimanual palpation over the lumbar mass, pus exuded from the operation wound. She was taken to the operating-room and a lumbar incision made similar to the Simon kidney incision, and a large amount of pus evacuated. There was considerable granulation tissue which had broken down, and several abscess cavities were evacuated. Even after this the patient's temperature did not decline. The abscess was not entirely retroperitoneal, however, as the border of liver was visible. That night her temperature was 105° F, and her pulse very much accelerated. Within the next ten days she got along fairly well, and the wounds drained nicely, large amounts of slate-colored pus escaping. Later, patient developed shortness of breath, accompanied with a hacking cough. Dulness developed in the right lower chest, over which region the respiratory sounds were absent, with the other physical signs of fluid. Exploration showed the presence of pus, so that on the twenty-seventh day after the first operation the ninth rib was resected in postaxillary line, and considerable fetid pus removed. The patient's temperature that night rose to 106° F, pulse 140. She had lost weight and was almost reduced to skin and bone. She was in a typically septic condition. But she was stimulated and fed, and she rallied and was getting along fairly well, running

a septic temperature, although the short hacking cough continued Ten days later she suddenly coughed up about a cup and a half of fetid pus, showing that she had had an abscess of the lung which had ruptured into a bronchus She collapsed, and it was thought she would die, but after swaying in the balance for two or three days between life and death she finally rallied and got along fairly well again All this time her pulse ranged from 120 to 160, temperature ranged from 102° to 106° F Two weeks after this, there being considerable dulness of the right lung, and it being difficult to diagnose the exact condition, owing to the thickened condition of the pleura and partial consolidation of the lung, the resection wound having previously healed, and cavity having granulated up, the upper right chest filled with pus again, the heart displaced to the left side, left chest practically negative, so an aspirator was inserted into the sixth right interspace in anterior axillary line and pus was discovered Under Schleich anæsthesia the speaker did not resect a rib, but went through bluntly and inserted a tube, evacuating a large amount of pus This abscess cavity was separate and distinct from the previous cavity Patient was in an extreme condition, but finally rallied, and after being in the hospital for three months she eventually recovered The patient was exhibited, well and strong, having regained all of her former weight To summarize, there was a perforation of appendix on seventh day, appendicectomy and drainage next day Twelve days later lumbar abscess drained Fifteen days later empyema of same side drained by resection of rib Ten days later pulmonary abscess on same side coughed up Fifteen days later another empyema higher up was drained

INTERSCAPULOTHORACIC AMPUTATION FOR SARCOMA OF THE SCAPULA

DR A E HALSTEAD exhibited a man, fifty-seven years of age, who consulted him about the middle of September of this year in regard to a swelling on the shoulder He gave the following history About a year ago a horse struck him with his teeth on the shoulder, but did not break the skin A couple of months thereafter the shoulder became painful When patient came to see him about the 15th of September the swelling had been noticed for about three months Both pain and swelling had gradually

increased. The swelling occupied the outer part of the scapula and shoulder-joint, the most prominent part of the tumor being just beneath the spine of the scapula. The characteristic sensations of crepitation imparted during palpation of the tumor suggested sarcoma. The introduction of an exploring needle showed only bright blood. He was operated at St Luke's Hospital on the 21st of September. Dr Halstead did a Paul Berger operation, saying that the first step was to resect the inner third of the clavicle, the second to ligate the subclavian artery and vein, the artery being tied first, and, third, to amputate the whole upper extremity. No hæmorrhage of any consequence occurred. The trunks of the brachial plexus were injected with a 2 per cent solution of cocaine, so as to block the reflexes after the method of Crile. No shock followed the operation, the pulse remaining below 90 throughout. The wound healed by primary union. The patient was up on the third day and left the hospital on the tenth day after the operation. In this case resection of the scapula was considered, that is, removing the scapula and leaving the arm, but examination disclosed the end of the triceps to be invaded by the tumor. He said Drs Zeit and Goldsmith had examined the tumor, and had stated that it was a mixed giant and spindle-cell sarcoma. The specimen he had prepared at St Luke's Hospital showed a mixture of spindle, giant, and small round cells.

DR ARTHUR DEAN BEVAN had done three of these operations. The first case which he did was gone over carefully by himself and several other physicians. The case presented itself as a tumor of the upper end of the humerus, and careful observation was made to determine if there was any primary focus anywhere else in the body. No such focus could be found anywhere else, and the conclusion was reached that it was a case of primary sarcoma of the humerus. He therefore made an amputation with that diagnosis. Histological examination showed that it was a carcinoma. The patient died four or five months after the operation, with symptoms of enlargement of the prostate, although the patient was a comparatively young man, only forty-five years of age. Careful examination showed the case was one of primary carcinoma of the prostate, and that the bone tumor was a secondary carcinoma.

A second case he exhibited to the Society last year. He had a very excellent X-ray view of it, and by a process of exclusion

it was believed that it was a primary sarcoma. Amputation was accordingly performed. The patient was a physician. Histological examination showed it was a sarcoma. The patient was still living and engaged in active practice.

A third case he operated upon last spring. The patient was referred to him by Dr. Herrick. She was a woman, fifty-eight years of age, who had evidences of peripheral neuritis as the first symptoms of the trouble, then a pathological fracture of the humerus. They went over the case carefully, with a view to excluding, if possible, primary carcinoma. They could not find any evidence of primary carcinoma, and with that view an amputation of the entire upper extremity was made. Histological examination showed, however, that it was carcinoma and not primary sarcoma. The woman had a recurrence, died, and a post-mortem examination was obtained. The full reports of the post-mortem examination he had not as yet received.

Recently, while in New York, he saw a case in which a surgeon had made an amputation of the entire upper extremity for sarcoma, and in which the sarcoma had recurred in the inner third of the clavicle which was left. In his third case, the woman to which he had just referred, the recurrence of carcinoma took place in the internal third of the clavicle. The first evidence of recurrence was in the inner third of the clavicle.

These two cases made him think it would be wise to do a little more complete operation in cases of amputation of the entire upper extremity and remove the inner third of the clavicle as well. It could be done. He did not think it would add much, if any, to the danger. In a case of primary sarcoma involving the shoulder-joint, one could imagine that it might early involve the clavicle and extend to the cancellous structure of the clavicle throughout the entire bone, and from this extension there would be some malignant tumor cells in the little stump of the clavicle left in the amputation.

The surgeon must be careful not to do what he himself had done twice, namely, amputate the entire upper extremity for secondary carcinoma. From his limited experience, he believed that many of these cases were secondary carcinomas, having a small primary focus elsewhere.

DR. A. J. OCHSNER said that one point of importance in connection with these operations was the relatively greater perma-

nency of the cure in cases of sarcoma of the upper end of the humerus in which this operation was performed. He had done the operation twice, once in 1891, for sarcoma of the shoulder involving the entire joint. The patient was well after twelve years. The other patient was operated on nine years ago for sarcoma of the shoulder, and was also well at this time. In amputations for the cure of sarcoma originating in the bone or periosteum, if the surgeon did not remove the joint beyond the point involved, there was practically always a recurrence. For this reason, in cases in which amputation of the upper portion of the humerus was made for sarcoma, there was a recurrence almost always, while in similar cases in which the arm together with the clavicle and scapula were removed there was likely to be no recurrence of the disease.

As far as the severity of the operation is concerned, he was surprised at the fact that both of his patients desired to sit up about the second or third day after the operation. One of them insisted on going to the bathroom on the second day after the operation. He had expected to find that these patients would show severe shock, but this did not occur.

DR HALSTEAD in closing the discussion, said he had had occasion to look up the statistics of this operation at the time he operated on this patient, but did not find them as favorable as the remarks of Dr Ochsner would indicate. For instance, in Vol xxxi of the *ANNAIS OF SURGERY*, in which Fowler reported seventy-two cases of primary operation for malignant disease of the scapula, there were only five cases known to be well at the end of three years. One of these lived fifteen years, one five, which was probably an enchondroma. Schultz, in Vol xliii of the *Deutsche Zeitschrift*, taking the cases operated on since 1875, found an operative mortality of 7.14 per cent, and definitive recovery in 10.71 per cent. From these two reports, which were voluminous and really included everything from the time Larrey first did the operation, the mortality is shown to be rather high and the percentage of permanent cures very small.

Dr Halstead said that his own case presented some difficulty in diagnosis. The man had been anæsthetized, and an effort made to reduce a supposed dislocation of the shoulder-joint. This brought up the question of false aneurism or hæmatoma, which was excluded. The diagnosis was based upon feeling crepita-

ments and wire, or unite them with suture material through drilled holes. The selection of cases was necessary. There was no hard and fast rule. The English surgeons held fast to the non-operative treatment, and those who had had an opportunity to watch their results would see the bad results from non-operative or mechanical treatment, yet even with a wide separation of fragments it was astonishing to observe, after several months or a year, what the functional results would be. These results would be excellent, although there might be a separation of the fragments to the extent of half an inch, an inch, or an inch and a half. Such patients were able to walk, to ride horseback, and to use their limbs fairly well, but they had fibrous union. True bony union could be more certainly obtained by the use of sutures.

DR WILLIAM E. MORGAN said it was his fortune last spring to have the care of two patients with similar complications. He brought these cases up because they had some bearing on the subject, as showing how surgeons were obliged sometimes to do things for the treatment of one fracture which they were not able to do for another.

A man was brought to the Mercy Hospital in the early spring with a fracture of the right thigh at the junction of the lower with the middle third or a little below that point. He had also a stellate fracture of the patella in the same limb. Within two months thereafter he had another exactly like it, but in the other leg. It was absolutely necessary for the knee to be placed in partial flexion for a time, in order to bring the fragments of the femur together. Any operative interference for patella was out of the question, because the patient was threatened with delirium tremens, and he did not dare to anesthetize him. In this man's case he depended almost entirely on strapping for patella, using what he called oval straps, beginning low down on the leg, and gradually drawing up, in a manner which he indicated, then beginning high on thigh and strapping downward. When he came to the knee itself there was considerable bulging, with a tendency of the fragments to tilt upward, at the same time, the fragments were brought so closely together that there was little over one-quarter inch separation, and with his finger he felt that he was able to place the limb in a semiflexed position for the fracture of the thigh, without separating patellar fragments, then getting the

lower fragment of the femur so approximated to the upper that he felt sure of obtaining union. By straightening out the thigh by degrees, the patellar fragments came together. The man was laid up for about thirteen weeks before he was trusted to rise. The result in this case was excellent. There was union of the patella, fibrous perhaps, and he had a good useful thigh. Although there was some deformity of the thigh, with three-quarters of an inch of shortening, still he felt gratified with the result.

The other man left the hospital before he felt really safe in letting him about. He had not heard from him since, but examination of the patella before he left the hospital showed good solid union, and treatment was the same as in first case.

Some four years ago a man presented himself with both patellæ fractured, one thigh at middle, and a broken jaw. The results in the broken thigh and patellæ were good, but that of the jaw was poor, and he threatened to sue the hospital on account of the poor result obtained in the fracture of the jaw.

The speaker reserved operation as a secondary procedure in all fractures of the patella where it was not compound. His results from conservative treatment in ordinary fractures without operation had been just as good as from suturing. Therefore, he postponed the latter until he saw that useful union could not be obtained by the ordinary methods of dressings.

As to massage, he believed in it early, but he would a great deal rather have a man with a fracture of the patella come out with a stiff knee than have it too flexible. He would put off passive motion for a considerable time. He did not like to see it used short of six or eight weeks. As to active motion, from his own experience he would not permit the use of the knee-joint for at least ten weeks. If patients were permitted to walk too early, they were apt to use the knee too freely, and sometimes in going up and down stairs they might give it a sudden wrench, and if there was only fibrous union this would very likely be broken.

DR THOMAS A. DAVIS said that the treatment of fractures of the patella was unsatisfactory without the open method in cases where there was some separation, say over half an inch, because of the intervention of the soft tissues, and it was impossible to predetermine the conditions without an external incision. In the

last two years he had a case of a patient who had sustained three fractures of the patella from indirect violence. In this case there was extensive interposition of the soft tissues, so that he could not expect firm fibrous union. The patient, the father of a senior medical student at the College of Physicians and Surgeons, came to the city from Minneapolis to see his son graduate, and in alighting from the train sustained a transverse fracture of the patella. He was brought to the hospital, and on examination it was found that there was separation of over one-half an inch, likewise considerable swelling of the joint. The speaker ordered a few days' rest, massage, and hot applications to the joint, and at the end of ten days he made a hoiseshoe-shaped incision and wired the patella with silver wire, after drilling through the fragments. In a month's time the patient was allowed to return to Minneapolis. Six months after he got home and had been attending to his business nearly all of his time, he was visiting a stock farm one Sunday, and, while in a stall examining a horse, the horse suddenly lurched over against him and he felt pain in his knee-joint. This did not prevent him from attending to his business. He came to Chicago six months later, and it was found that the function of the joint was not good. There was still a little swelling, although the patient had excellent control of the leg. At the same depôt, and under the same circumstances, he fractured his other patella. Much to the author's amazement, he found a separation of the fragments to the extent of from two and a half to three inches in the patella which he had first wired, also separation of three-quarters of an inch of the recently fractured patella. The treatment of this case presented a serious problem. Here was a man, weighing 225 pounds, with considerable separation of the fragments of one patella, and a recently fractured other patella, with separation. He concluded to operate on the recently fractured patella first. He placed the patient under the same treatment as he had given in the first instance. Ten days later he drilled the fragments and wired. In a week's time he found separation of the fractured ends to the extent of an inch. He anæsthetized the patient, and found that the silver wire he had used had broken. He had drilled four holes, put in two wires, and both pieces of wire were absolutely rotten. It was astonishing to him that this was not discovered before the wire had been used.

by others in the hospital. He twisted the wire freely, tightened it, made very firm and close approximation, and it seemed at least strange afterwards that this wire should have broken and its friability was not discovered before. He put in more wire, and in two weeks' time, finding there was no separation or space, advised operation on the other patella, promising nothing. He was unable to get the fragments in anything like accurate apposition for wiring. Accordingly, he did a tendoplastic operation on the quadriceps extensor, brought the fragments into close approximation by freshening the edges of the bone, sutured with silver wire, and the soft tissues with catgut. The patient was now perfectly well and attending to business.

In operating on the first patella he found there was perfect union by the first wire, that there was no motion, and that if he had not done the operation on the quadriceps extensor he would not have found the first fracture. It was necessary to free the entire patella. He found silver wire two-thirds of an inch above the point of recent fracture, and on making a careful examination he found a little groove. But passing the knife in, he found there was firm calcareous union, if it was not true bony union.

The subject was interesting to him because he had seen a number of surgeons undertake immediate operation in cases of fracture of the patella, but he had never seen satisfactory results from the immediate operation. He had seen the knee-joint drained in two instances for infection after the immediate operation.

In regard to subcutaneous suture, it had many objections and nothing to recommend it. In the first place, it passed through the wounded tissue and exposed the wound to infection. In the second place, as it was impossible to determine the amount of soft tissue that might be in front, it afforded no better results than no operation.

He remembered several years ago investigating the subject of treatment of effusion into joints, and some Swedish or Norwegian surgeon reported a large number of cases to show that massage was sufficient in practically all cases to remove the blood-clots or blood, and afforded good functional results. The open treatment offered the same advantages.

DEMONSTRATION OF MCGRAW LIGATURE

DR A J OCHSNER stated that the use of an elastic ligature for gastro-enterostomy in which the pylorus was not completely obstructed either by carcinoma or cicatricial constriction, and also for making anastomosis between the intestines, was suggested by Professor Theodore McGraw twelve years ago, but was not used in the human subject until rather recently

Regarding the speed with which it could be performed, one could calculate this from the amount of sewing that must be done. It was an operation that could be done as quickly as that by means of the Murphy button. So far as he could determine, it took about the same length of time. He had used the McGraw elastic ligature in forty cases. The effect on the patient was no greater than that following the use of the Murphy button. The advantage of the elastic ligature was practically the same as that of the Murphy button. The portion caught within the ligature sloughed away within a few days, and left a clean-cut opening between the two tubes. In the forty cases in which he had used it there had not been any peritonitis. Of this number, there were several that were not old enough to be counted. Three died, one two weeks after the operation, from exhaustion, another three weeks, and another in six weeks.

Before using this method he made an exploratory operation much more frequently than he had made it since. Since he had performed this operation, he had closed only very few cases, without making gastro-enterostomy, where there was pyloric obstruction, whereas formerly, whenever it seemed the patient could not possibly live more than a few weeks, he had closed the abdomen without doing anything. Theoretically, he believed that all mechanical means must ultimately be abandoned, and that surgeons must do all of these operations with the needle and thread. Practically, he had tried nothing that had been as satisfactory for making gastro-enterostomy or entero-enterostomy in suitable cases as this particular method.

DR D A K STEELE asked whether in any of the forty cases mentioned serious symptoms occurred from acute intestinal obstruction where the McGraw elastic ligature was used. He mentioned that recently a patient died in Rochester, Minn., from intestinal obstruction following the use of the McGraw elastic

ligature Too long a loop of the jejunum was used, regurgitation occurred into the loop, and kinking occurred, the patient dying from acute obstruction, with persistent, uncontrollable vomiting, and even after the stomach had been washed out the regurgitation kept up In this case the elastic ligature was passed through the jejunum transversely, including more than one-half of its diameter, which was an error of technique

He said the objection to the elastic ligature and to the Murphy button was that these devices worked while surgeons were asleep Personally, he liked to see the work finished In any mechanical device that was used, one had to depend upon the element of time, it took hours or days for the elastic ligature or a mechanical contrivance to perform its function, which was somewhat uncertain

He agreed with Dr Ochsner in saying that ultimately surgeons would have to come to the use of needle and thread The ligature, while it was quick and immediately satisfactory, so far as rapidity of completing the operation was concerned, had some disadvantages

DR E WYLLYS ANDREWS said he saw Dr Ochsner use the McGraw elastic ligature soon after the publication of Dr McGraw's original paper, and he gave it a trial himself shortly thereafter He had employed it in a dozen cases, with one death The patient who died was one of his last cases Two cases he had about a week ago, one of which died He was disposed to be more enthusiastic than Dr Ochsner with the somewhat limited experience that he had had with the ligature In the use of the elastic ligature one had a device that was a little quicker and had some of the advantages of the Murphy button It had the additional merit in that the surgeon did not have to lay open a hollow viscus which might infect the peritoneum He had noticed that after the use of the ligature the patients came off the table in a good condition The man who died, and was seventy years of age, who had been vomiting, had to be nourished per rectum for a week before the speaker operated on him He was in a very bad condition There was absolute pyloric obstruction, yet after the operation the patient came off the table with a pulse of 80, with no shock This was his experience in nearly all of these cases Most of the patients passed the ligature on the twelfth day or earlier

DR ARTHUR DEAN BEVAN was interested in hearing a report of forty cases, with practically no operative deaths. This meant a great deal, and yet, when one turned to the work that had already been accomplished with needle and thread, the results were equally excellent. For instance, the admirable report of Moynihan, of seventy-six gastro-enterostomies, with only one death. He said Moynihan had made the statement that gastro-enterostomy could be performed with needle and thread in seventeen minutes. With these two facts to be weighed, and with his own limited experience in this work, he chose without any hesitation to do this work with needle and thread, and had not as yet used the McGraw ligature. He thought it was possible for surgeons to do the needle and thread operation with two continuous sutures, the first involving all the coats of the bowel, the second the Lembert, within five or six or eight minutes, as rapidly as could be done by the McGraw elastic ligature. According to the statistics of Moynihan, it could be done probably quite as safely, as far as the immediate mortality was concerned, and he thought with better prospects in regard to permanent benefit. One might in advanced carcinoma cases use a mechanical device which would shorten the operation six or eight minutes. This was the situation as it appeared to him, and yet he thought his opinion was not of much value, because he had had no means of comparing the McGraw operation from personal experience with the needle and thread method.

DR OCHSNER, in closing the discussion, said that his own feeling was exactly that expressed by Dr Bevan. Practically, he had never done anything in the way of gastro-enterostomy that was as satisfactory as it was by this method, but he had not theoretically come to consider it the final method. He had felt that if he could do the operation as well as Moynihan had done it with needle and thread, he would not use the McGraw elastic ligature, but he had never done it nearly as well.

With reference to the opening, he recalled one case in which there was an ulcer of the pylorus and an ulcer of the ileum about eight inches from the ileocaecal valve. After he had made gastro-enterostomy for obstruction of the pylorus, he did not examine other portions, and did not find the obstruction in the ileum. But the fact that there was obstruction became apparent later, so he made a second operation, and found a similar ulcer in the mesen-

teric side of the ileum to that which he had found formerly on the lower side of the pylorus, and with a similar obstruction due to cicatricial contraction of the ileum. He made anastomosis between the ileum and sigmoid above the stricture in the ileum. In this case he had an opportunity to examine the anastomotic opening between the stomach and jejunum. It was large. It would admit three fingers. He thought originally the opening was about seven and a half centimetres long. He said Dr Walker, of Detroit, had made experiments upon dogs which bore out this observation.

Having made his openings at the lowest portion of the stomach and on the anterior wall, at least three inches in length, he had not had the form of obstruction to which Dr Steele had referred. The case referred to by Dr Steele, he said, was one in which Mayo made a Mikulicz operation with the elastic ligature. He put the ligature in obliquely, grasping a little more than one-half of the diameter of the jejunum, near the point where it came out from the transverse colon, and attached it to the posterior surface of the stomach, and so he virtually sewed up the intestine, because by tying the ligature it closed the intestine, and this gave the bile on the proximal side a chance to balloon it and cause necrosis.

The speaker said that his inclination has been against the use of mechanical means, and still he had used the Murphy button in preference to needle and thread in many cases because his results were better. Like Dr Steele, he did not like anything that was working while he was sleeping. Still, if more people got well from the use of these mechanical devices, then he would use them until he could use the needle and thread more dexterously and expeditiously.

REVIEWS OF BOOKS.

MODERN SURGERY, GENERAL AND OPERATIVE By JOHN
CHALMERS DA COSTA, M D Fourth Edition Philadelphia
W B Saunders & Co, 1903

Five years ago we presented a review of the second edition of this book. It seemed to us at that time that it filled no particular place, and simply added to the already large category of unnecessary medical publications. Of this fourth edition we shall have to say something different. It fills a place, and is a credit to the high class of surgical publications which the advancements of the time have made necessary. We have no greater criticism to offer than this: it is so unlike and so superior in every respect to the first edition that it should not be called an edition of the same book. The old book has had its defects revised out of it, and so much added and amplified that it is indeed a new publication.

The book before us is well written and satisfying. The text is modern. Indeed, there are references in the text to publications which had appeared but two months before the book was on the market. The value of the work is greatly enhanced by numerous references. There are valuable statistics compiled from the general literature, and quotations from the most recent articles published upon many surgical subjects. The whole work has a thoroughly up-to-date character.

The first chapter is devoted to bacteriology. This is brief but sufficient. The different germicidal agents are taken up and described systematically. There is an excellent description of the uses and character of corrosive sublimate.

Serum therapy is discussed in its relation to surgical diseases. The author warns against many of the unscientific and

sensational claims that are made for this treatment "It is our duty to study, experiment, and observe, and to reach a conclusion only after honest, careful, and thorough investigation. A little scepticism is as yet a safe rule."

The chapter on a sepsis and antiseptics is one of the best on this subject that we have seen. The subject of repair is well presented. The reparative method in each of the structures of the body is taken up separately. Under surgical fevers all of the fever-producing conditions are taken up separately. Besides the fevers ordinarily described, we find described the fevers of iodoform absorption, pyæmia or mercurial fever, fever of morphinism, fever of cocaine poisoning, hepatic fever, hysterical fever, emotional fever, etc.

The etiology of tumors is fully and judiciously considered. The recent discussions concerning the etiology of cancer are referred to, but no partisan position assumed.

We are glad to encounter in a text-book the statement that "the radical treatment of varix of the leg often does good, often relieves some annoying condition, but rarely absolutely cures." The truth of this will be more fully appreciated when surgeons follow for a longer time and make a more careful study of the later histories of these cases.

The operation of Matas for aneurism is fully described. Under the treatment of hæmorrhage, the author gives fifty rules for the arrest of primary hæmorrhage.

Bristow's reports of cases of evulsion of the brachial plexus are described. The section on cranial topography is worthy of note. Concussion of the brain is not made clear. Under the subject intracranial tumors we encounter the new, yet not generally accepted, view that "no region of the body is so liable to tumors as the brain."

The chapters on the surgery of the spine and the surgery of the chest are good. Fowler's paper on the surgical treatment of intrathoracic tuberculosis is freely quoted. Of particular value

is the chapter on abdominal injuries After a general discussion of the diagnosis of abdominal injuries, the author takes up in order contusions of the abdominal wall without injury to viscera, then injuries with damage to the peritoneum or the viscera, then rupture of the stomach without external wound, and finally rupture of the intestine without external wound These are given very practical treatment Methods for the identification of the different segments of the bowel are given

The author's views upon the subject of the operative treatment of appendicitis are the views which are now most generally accepted by American surgeons Intestinal surgery is presented as one of the best features of the book All of the best of the operations for gastro-enterostomy and intestinal anastomosis are described and illustrated

Of the operations for hæmorrhoids the author favors the use of the ligature as the easiest and most generally useful

Every anæsthetist should read the chapter on anæsthesia and anæsthetics in this book It is a thoroughly up-to-date *résumé* The preparation of the patient is fully discussed The differences and the effects of ether and chloroform and the practical points in their administration are presented The other agents, such as chloroform and oxygen, ether and oxygen, and the numerous other mixtures and agents, are described A section is devoted to the treatment of the complications developing during the anæsthetic state "Cocainization of the spinal cord," he says, "is not growing in popularity It is regarded by most surgeons as rather a surgical curiosity"

Diseases and injuries of the thyroid gland and the surgery of the lymphatics are brought fully up to date The references are to the very recent literature on these subjects The same may be said of the surgery of the kidneys and bladder Bristow's method of dilating the bladder with air for suprapubic cystotomy is endorsed

The different methods of dealing with the hypertrophied

prostate are judiciously considered. The newer perineal operations are described.

The book closes with a chapter on amputations and a chapter on the X-ray as a diagnostic and therapeutic agent,—both good.

We have only these criticisms to offer. A vague thing or condition called "scrofula" is described to the detriment of the book. The impossibility of bony union in unoperated fracture of the patella and the constant presence of intervening clot and torn aponeurosis are not made clear. The picture on page 633 is a surgical caricature and an anatomical burlesque. Under the heading, "Effect of Bacteria upon Bacteria," we find this: "The streptococcus of erysipelas is antagonistic to the bacillus of anthrax and also to syphilis, tuberculosis, and sarcoma." Now, just what bacteria of sarcoma are meant here we do not understand, particularly as we believe that bacteria have nothing to do with sarcoma. The excision of chronically inflamed bursæ sacs is not mentioned.

These few things stand in such relation to the immense practical value of the work and its completeness as a surgical manual that they need be considered only as of small importance. The book is a credit to the author and publishers, and a stepping-stone towards the supremacy of American surgery.

JAMES P. WARBASSE

CHIRURGIE DES OVAIRES ET DES TROMPES. Par A. MONPROFIT, Professeur de Clinique Chirurgicale à l'École de Médecine, Chirurgien de l'Hôtel-Dieu d'Angers. Paris. Institut International de Bibliographie Scientifique. 1903.

SURGERY OF THE OVARIES AND TUBES. By A. MONPROFIT, of Angers. Presse Scientifique Internationale, 93 Boulevard Saint-Germain, Paris.

This excellent work is dedicated by the author to Felix Terrier who has written a preface in which he felicitates the author upon the rare judgment shown in advocating conservative procedures and the courage in radical operations.

The book opens with a description of the older operations for cystic tumors of the ovary. The several methods of puncture and tapping are described with the histories of these methods. Among these operations which are of historic interest are described puncture and paracentesis, puncture with injection into the cyst, puncture and drainage, incision of the cyst after provoking adhesions to the abdominal wall, marsupialization, vaginal puncture, perineal incision, parascial incision, and rectal puncture and incision. These methods are set forth in detail, and are given the same attention as though they were acceptable surgical procedures.

The author next takes up the modern conservative operations upon the uterine adnexa. The technique of abdominal section is carefully described, a great deal of attention being given to the instruments and appliances. Among these we find a self-retaining retractor, invented by the author, one blade of which fits in the vagina, the other, a broader blade, makes downward traction in the lower angle of the median abdominal wound. "*Quelle simplicité!*" the author observes after describing the method of placing it in position.

A section of several chapters is given to conservative operations upon the ovaries, in which many valuable operative procedures are described. It is in this chapter that the operation of intra-abdominal massage of the ovary is described, an operation which Terrier refers to in his preface as a manifestation of the march of surgery on the road of progress. In this operation the ovary is lifted into the wound and subjected to a gentle rolling massage between the fingers. The operation is applied in cases of congestion and chronic inflammation. The author has used it in a number of cases with good result.

Operations upon the tubes and ovaries by the vaginal route are well described. It is in this field that the French surgeons have excelled.

The second half of the book is devoted to the radical opera-

tions Normal ovariectomy for the cure of extra-ovarian conditions he gives Battey the credit of first doing When we come to the history of ovariectomy or cysto-oophorectomy, McDowell is not regarded as the pioneer Robert Houston is the father of ovariectomy, the author claims He shows that Houston, of Glasgow, did the operation in 1701, more than a hundred years before McDowell, and refers to an article by Finlayson in 1896, and to an article in the *British Medical Journal* in 1897, as authorities for the statement The report of Houston's case appeared in *The Philosophical Transactions* (Vol xxxiii) in 1726 The operation, he shows, was first suggested by Th Schorkopoff in 1685 The medical historian will find some valuable information on this subject

This book is a systematic treatise on the surgery of the ovaries and tubes It is provided with a complete index, and a fine attention to system characterizes the work The chapter on each disease is divided into parts falling under these headings definition, synonyms, varieties, history, operations, results, indications The historical considerations are especially full and valuable

The work is well illustrated Many of the pictures are original the best are borrowed from Kelly

JAMES P WARBASSE

A TREATISE ON ORGANIC NERVOUS DISEASES By M ALLEN STARR, M D, Ph D, LL D, Professor of the Mind and Nervous System in the College of Physicians and Surgeons (Columbia University), etc Pp 742 New York and Philadelphia Lea Brothers & Co, 1903

It would be impracticable to epitomize the entire work of Professor Starr, as well as unfair to both author and book but one or two points of excellence especially such as appeal to the general practitioner, deserve mention Possibly because of its showiness the localization of cerebral neoplasms and injuries is

always of paramount interest to physician, surgeon, and neurologist alike, and the chapters devoted to abscess and neoplasms, while brief, are excellent

The diagnosis and localization of brain diseases—a most important section—receive somewhat more detailed treatment, the various subjective and objective symptoms being traced to their anatomical source. Not the least valuable portion of this chapter is the abundance of diagrams and plates, though for that matter these necessary adjuncts are unusually profuse and good throughout the entire volume, some being old friends, like the diagram of the “concept Bell,” but most being new. Professor Starr is fortunate in being able to draw from the anatomical preparations of the College of Physicians and Surgeons as well as from his own extensive material. An unusually large proportion of the plates are colored,—a distinct advantage.

The importance of ocular symptoms is duly emphasized in an interesting section and embellished with colored plates of the fundus oculi in health and disease. The cranial nerves are included in this chapter, which is one that will well repay careful study. While expertness in ophthalmoscopy can be reached by only a few, all should be impressed by the important aid that comes from an examination of the fundus and from alterations in the visual field, and should in all appropriate cases *early* avail themselves of experienced aid in this form of diagnosis.

The author furnishes a very acceptable chapter on apoplexy, one that should appeal to every one who has had this condition to deal with. After urging the imperative need for the exact determination of the cause and the location of the injury, he gives some thoroughly practical directions for the management of the case. Among other matters he urges the value of venesection when rationally employed, and condemns the routine practice of administering potassium iodide, quoting Carter to show that it does not affect blood-pressure, and hence is not indicated in arteriosclerotic patients. While it is by no means fair to judge

from a limited experience and is possibly presumptuous to question the dictum of such an authority, the reviewer feels that he must urge his belief that iodine is at least occasionally useful in patients with high tension arteries where nephritis is a complication, judging from a fall of twenty-five to thirty millimetres pressure with a corresponding increase in the amount of urine secreted under moderate doses of hydriodic acid. However, *exceptio regulum probat*.

Tabes dorsalis furnishes material for a well-written chapter. The arrangement by topics and the orderly grouping of the subject-matter together with the clear, terse style makes this, as most of the other chapters, very attractive reading. The favorable comment on the preceding chapters selected at random may be extended to the whole book, although there are one or two minor matters that might be criticised unfavorably were one so inclined. The index, for example, while good, is not so complete as it should be in a work of such importance. It has been objected that the consideration of a number of conditions is lacking in detail. While this may be a fault in the eyes of the neurologist, it seems from the view-point of the general practitioner to be abundantly ample for a text-book, for the principles of diagnosis and treatment are thoroughly emphasized.

HENRY GOODWIN WEBSTER

CLINICAL PATHOLOGY OF THE BLOOD. A Treatise on the General Principles and Special Applications of Hæmatology. By JAMES EWING. Second Edition. New York and Philadelphia. Lea Brothers & Co., 1903.

In revising the first edition of this work, while Dr. Ewing has duly considered the advances made in hæmatology and has made additions to several chapters, he has made but few radical changes.

The work is divided into five parts. 1. General physiology and pathology of the blood. 2. Special pathology. 3. The acute

infectious diseases 4 Constitutional diseases 5 General diseases of viscera

Each chapter is accompanied by an extensive bibliography, which greatly increases the value of the work to the advanced student

To the surgeon the sections on acute infectious diseases and carcinoma and sarcoma are most important. The author states that "while the rule that suppuration induces leucocytosis is almost invariable, it must be remembered that leucocytosis may promptly disappear when the exudation ceases, and that suppurations involving mucous surfaces may induce very slight leucocytosis." In discussing the bacteriology of the blood, the author has not changed from the position which he held two years ago, despite the many convincing experiments of other workers. The reviewer does not believe that the evidence has been fairly presented by Dr. Ewing, and that he is not justified in drawing the conclusion that, "In the great majority of cases of local or general septic infection, septicopyæmia, septicæmia, pyæmia, diffuse suppuration, osteomyelitis, etc., bacteria are present in the circulating blood only for short periods and at frequent intervals, most frequently during chills. In a very moderate number of cases of septic infection, especially those which are not attended by local abscess formation, the bacterial agent may be isolated from the blood during the progress of the disease."

In reference to carcinoma, it is stated that, in view of the variety and frequency of the complications of this disease, it is unwise to draw any narrow diagnostic conclusions from the presence or absence of leucocytosis. On the other hand, in sarcoma there appears a distinct leucocytosis which tends to persist and increase.

The work as a whole is admirably written. The illustrations are good. The arrangement of the text adapts it to the use of the student and general reader, for the theoretical discussions and

abstracts, etc., which interest the more advanced workers, have been put in fine print

PAUL MONROE PILCHER

TRANSACTIONS OF THE SOUTHERN SURGICAL AND GYNÆCOLOGICAL ASSOCIATION Vol XV Fifteenth Session Edited by W D HAGGARD, M D, 1903

This volume contains the papers and discussions and the minutes of the proceedings of the fifteenth annual meeting of this society, held at Cincinnati. The papers are of a high class, and deal with the questions uppermost in professional thought. The volume is well edited and does credit to the association and its editor.

The scientific work represented in the Transactions of this Society shows that it is entitled to take its place among the scientific societies of the world. The first subject dealt with is the Treatment of Hypertrophy of the Prostate. In the discussion of this subject, Dr A H Ferguson presents the advantages of the perineal operation for the extirpation of the hypertrophied gland. The median perineal incision he declares to be the incision of the expert. The present status of the perineal operation, he says, shows about 200 cases operated upon with less than 5 per cent mortality.

Dr Joseph Taber Johnson's paper on the general subject of Gonorrhœa is followed by a discussion in which it is evident that there is a good deal of difference of opinion concerning this question, and, furthermore, that it is one of the most important subjects with which the medical profession has to deal.

Dr George H Noble has a paper well illustrated, describing a Method of Suturing the Fascia and Levator Ani Muscle in Perineorrhaphy. He shows also a method of operating for complete laceration of the perineum, designed for the purpose of eliminating danger of infection from the rectum. The illustra-

tions of this paper would do credit to a text-book of surgery. It shows careful preparation and represents a high class of work.

The reviewer is attracted particularly by a paper by Dr Hugh H. Young on the Surgery of the Lower Ureter. The author describes first the anatomy of the pelvic ureter, and then takes up separately each of the anomalies and diseases of this portion of the ureter requiring surgical treatment. These are prolapse, ureteritis, calculus, fistula, tumors, valve formation, and stricture. Seven cases are reported illustrating these conditions.

Able papers by Dr Samuel Lloyd on Gastro-enterostomy with the McGraw ligature, Maurice H. Richardson on The Indications for Extirpation of the Gall-Bladder, A. H. Ferguson, G. H. Noble, and F. F. Simpson on Treatment of Retrodisplacements of the Uterus, J. S. Holsley on Posttyphoidal Disease of the Ribs, J. B. Deaver on The Treatment of Gall-Stones, and E. D. Martin on Spinal Analgesia, add interest and value to the volume, which closes with sketches of the lives of some of the eminent men of the South. There are excellent full-page copies of portraits of McDowell, Sims, Dudley, Warren Stone, Paul F. Eve, Haggard, McGuire, Bedford Brown, Robert Battey, David W. Yandell, William T. Briggs, Claudius Henry Mastin, Henry F. Campbell, Robert A. Kinloch, Albert B. Miles, and James T. Jelks.

JAMES P. WARBASSE

INTERNATIONAL CLINICS. Edited by A. O. J. KELLY, A. M., M. D.
Vols. II and III, Thirteenth Series, 1903. Philadelphia:
J. B. Lippincott Company, 1903.

Of these two volumes Vol. II contains a series of papers and discussions upon the summer diseases of children. There are also a paper by Dr. Opie on the symptoms and treatment of disease of the pancreas, and one by Dr. Deaver on the diagnosis and surgical treatment of disease of the pancreas. Another section of this volume is given to therapeutics, in which we find papers on Trunczek's serum in arteriosclerosis, practical notes on the pro-

phylactic and curative treatment of influenza, malaria, erysipelas, and ozæna, local treatment as a recent advance in therapeutics, and the rest treatment. Other sections are given to general medicine, surgery, pædiatrics, obstetrics, gynæcology, and ophthalmology.

Dr. Opie gives an exhaustive discussion of pancreatic diseases. The author first discusses the symptoms of the various lesions of this organ. These fall under the two heads of (1) symptoms which result from impairment of the internal function of the pancreas, and (2) symptoms which follow alterations of the external secretions. He also takes up the clinical significance of fat necrosis, acute hæmorrhagic pancreatitis, acute gangrenous pancreatitis, chronic pancreatitis, and pancreatitis as a complication of other diseases.

Dr. Deaver's paper is an especially valuable contribution to the surgery of the pancreas, and is illustrated with a large number of reports of cases.

The diagnosis and treatment of hæmorrhoids is discussed by Dr. Gay, who gives the practical methods of examination and diagnosis, and then goes on to the treatment. Many cases he insists do not require operation. The treatment by antiseptic astringent applications is advised in the mild cases. He also advocates the injection of carbolic acid in suitable cases. Other cases, without distinct tumor, are treated by the application of nitric acid. The usually employed surgical procedures are also described.

The most important surgical paper is that by Mr. Bishop on abdomino-pelvic diagnosis. This lecture deals with swellings, and is one of a series of lectures on abdominal diagnosis. The value of Jenner's test for the differentiation of tumors of the abdominal wall is discussed. Consideration is also given to the differential diagnosis of the various hernias.

Dr. Roncali has reported a lecture on the surgical relief of epilepsy in which early and prompt operation for this condition is advocated.

Vol III contains a symposium of medical and surgical papers on diseases of the gall-passages and gall-bladder Dr Musser's paper shows valuable temperature studies and reports of cases He advocates cholecystotomy as the best cure for cholecystitis A very valuable paper is that on the causation, symptoms, and diagnosis of gall-stones by Dr Rudolph This presents the subject in a very clear light

Dr Stockton's paper considers the diagnosis and treatment of cholecystitis from a medical stand-point He insists that, while it is not only useless but reprehensible to delay the assistance which surgical intervention alone can bring to many patients, we are not yet in a position where it is proper to demand a cholecystotomy as soon as a diagnosis of gall-stone is made The majority of patients, he says, can be greatly benefited by appropriate medical treatment, and many will recover by medical treatment alone, and he goes on to lay down a very rational line of treatment for these cases We cannot see, however, how salol, sodium salicylate, aspirin, and antipyrin can have much effect on these cases The surgical side of this question is discussed by Dr Lejars and Dr Deaver Other surgical papers are on cocaine anæsthesia, general anæsthesia, asepsis and antiseptis, gastrotomy, concussion of the brain, intracranial tumors, and the modern treatment of varicose veins

Each of these volumes contains a good index

JAMES P. WARBASSE

TO CONTRIBUTORS AND SUBSCRIBERS

All Contributions for Publication, Books for Review, and Exchanges should be sent to the Editorial Office, 386 Grand Ave., Brooklyn, N. Y.

Remittance for Subscriptions and Advertising and all business communications should be addressed to the

ANNALS OF SURGERY,

227-231 South Sixth Street, Philadelphia

ANNALS OF SURGERY

VOL XXXIX

FEBRUARY, 1904

No 2

ORIGINAL MEMOIRS.

TREATMENT BY DIRECT DILATATION OF CICC- TRICIAL ŒSOPHAGEAL STRICTURE

BY JOSEPH RILUS EASTMAN, M D,
OF INDIANAPOLIS

IT is not within the intent of the paper here presented to discuss the treatment of strictures of the œsophagus due to the presence in or about the gullet wall of malignant or benign neoplasms or of those due to syphilis, tuberculosis, or œsophagismus, nor does the writer intend that his remarks shall be held to apply to the treatment of stenosis due to external causes.

It is well known that the most common, if not the most extensive, strictures of the œsophagus are those occasioned by the cicatricial contraction following the destructive action of escharotics and the trauma produced by the impaction of foreign bodies. For the first few weeks after the swallowing of a corroding fluid, which may have immediately destroyed the mucous membrane or ignited an extensive ulcerative process, the passage of an œsophageal bougie of any sort must be regarded as an undertaking attended with considerable risk.

It is questionable whether it is justifiable at such a time to attempt the introduction of any dilator. The use of the

slightest force under such conditions is certainly strongly to be condemned. Following the ulcerative stage, however, the œsophageal wall undergoes certain rather constant changes which render the passage of soft bougies in careful hands less dangerous than is generally believed.

The intelligent introduction of a bougie for the treatment by dilatation of a cicatricial stricture of the œsophagus implies the previous exclusion of the possibility of the presence of aneurism, neoplasms, syphilis, tuberculosis, or abscess. That is to say, the intelligent treatment by dilatation of cicatricial stricture presupposes a correct diagnosis.

Since they premise certain more or less original theses pertaining to treatment, which the writer wishes to submit, it is for the sake of clearness desirable to review a few points relating to the pathology of cicatricial œsophageal stricture.

Concerning fibrous or organic stricture occurring as a sequence of ulceration caused by the swallowing of caustic or hot fluids, Greig Smith (Vol. 1, page 465) states that "the stricture usually begins high up in the gullet and extends a considerable way downward. It is very rarely annular. The mucous membrane is replaced by a gray or bluish-gray tissue of a peculiarly hard and resistant nature. The muscular layer is rarely involved. The passage through the stricture is devious, but not to such an extent as in carcinoma."

Tillmans (*Lehrbuch der Chirurgie*) is authority for the statement that after deep destruction by caustics the œsophagus is transformed into very thick cicatricial tissue. Von Ziemssen likewise invariably found the dilated wall of the œsophagus above the cicatricial stricture much thickened.

Richardson (Dennis's "System of Surgery") says that "the muscular coats are hypertrophied in stricture of the œsophagus. This hypertrophy appears early. It is especially marked in the circular fibres, is greatest close to the stricture, and extends for some distance above it."

Cicatricial strictures are dense and unyielding. They tend to contract progressively without deep ulceration, and whereas the œsophagitis corrosiva immediately following the swallow-

ing of an escharotic may weaken the gullet wall to a greater or less degree, with the development of scar tissue at the site of the stenosis as well as above and below the strictured segment, and with the development of muscular hypertrophy, the wall of the œsophagus in most cases becomes really tougher than in the normal state

The presence of a diverticulum presupposes some pathologic change in the œsophageal wall (usually a hernial protrusion of the mucosa through the separated fibres of the inferior constrictor muscle) Diverticulum will hardly be expected to follow the deglutition of an escharotic unless the destructive action be great enough to lead to peri-œsophageal phlegmon. Such cases, being in nearly every instance rapidly fatal, are certainly very rarely presented to the surgeon as œsophageal strictures for treatment by dilatation or otherwise. In 100 autopsies after œsophageal stricture, Von Hacker found seven diverticula, all the result of peri-œsophageal phlegmon produced by the same traumatic agent that caused the stricture. Were diverticulum present as a complication of organic cicatricial stricture, a bougie might with little force be thrust through an area thus weakened. It is therefore fortunate that the combination of diverticulum with old cicatricial stricture is rare.

In Fig. 1 is seen an œsophagus strictured from the crossing of the bronchus almost to the cardia. The wall of the œsophagus is thickened from the cricoid cartilage to the stomach. The wall of the sacculated portion above the stenosis showed upon microscopical examination marked muscular hypertrophy. Thus, so far as the thickening is concerned, is a rather typical gross pathologic specimen of cicatricial stricture of the œsophagus. The danger of thrusting a flexible sound through the hypertrophied coats of this gullet would be slight—that is, the danger of perforation incident to the passing of bougies would not be increased but decreased, by the thickening and toughening of the œsophageal wall.

In Fig. 2 is represented a section from a normal area of the œsophagus in a case of stricture. The section shown in

Fig 3 is taken from the œsophageal wall in the same case, near the site of stenosis. Each section is magnified eighteen diameters. It will be seen, therefore, that, owing to the muscular hypertrophy, the œsophageal wall near the stricture is twice as thick as in the normal state.

In Fig 4 is shown a section of the same œsophageal wall at the site of stricture. The mucosa, as will be observed, has been destroyed and removed by the escharotic. This section is magnified only eleven diameters, from which it appears that the œsophagus even at the site of the stricture with the mucosa destroyed is quite twice as thick as in the normal segments. It is also somewhat toughened by the presence of scar tissue. In Fig 5 (a section taken from the same œsophagus) may be seen large cells with large polar nuclei, Unna's plasma cells, the presence of which indicates the development of new connective tissue.

Various transitional forms of young connective-tissue cells are abundant in the submucosa above and below the site of stenosis.

To surgeons who have made gastrostomy for the relief of the distressing symptoms resulting from œsophageal stricture, the importance of persistence and patience in the attempt to accomplish the re-establishment of the œsophageal lumen by direct dilatation will be apparent. Since, in cases of cicatricial stricture, the gastrostomy is made with the view of utilizing the gastric fistula as an avenue of approach to the stricture for the practice of retrograde dilatation, it will be seen that the methods of Ssabanajew, Hahn, Frank, Witzel, and De Page, with their great advantage, so far as feeding is concerned, of providing a valve, are hardly applicable if the stricture is to be gradually dilated from below.

It would likewise be difficult to perform retrograde dilatation through the funnel-like invaginated depression in the stomach wall, after the performance of gastrostomy according to Stamm, without destroying the adhesions which make the Stamm operation efficient, that is to say, repeated stretching of the nipple-like invaginated canal would in time cause leakage

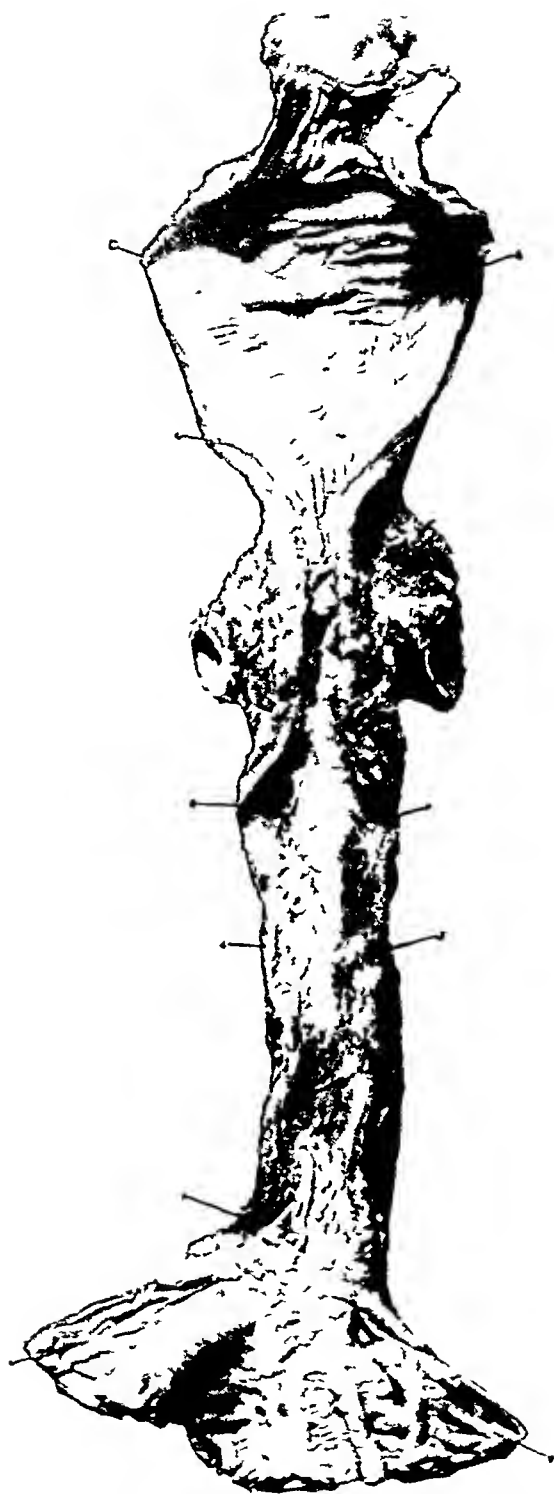


FIG. 1.—Extensive stricture of the esophagus showing thickening of esophageal wall throughout the whole length. The wall of the sacculated portion showing considerable thickening.



FIG. 2.—Section of normal portion of the esophageal wall in a case of stricture. Magnified eighteen diameters.



FIG 3—Hypertrophied wall of same œsophagus above stenosis Magnified eighteen diameters



FIG 4—Section at site of stenosis of esophagus shown in figure. Mucosa removed by esclerotic. Magnified eleven diameters. The esophageal wall is here markedly thickened.

If a stricture at or near the cardia can be dilated rapidly, completely, and safely at one operation, gastrostomy or gastrotomy must, it is clear, be regarded as operations distinctly preferable to direct dilatation, as they certainly must be in all cases of stricture of the œsophagus impassable by direct dilatation and in cases in which it is absolutely impossible to nourish the patient through a narrow and devious, though perhaps passable, canal in the œsophagus

An important fact, upon which too much stress cannot be placed, is this,—gastrostomy in stricture of the œsophagus is only a palliative operation. The stricture still remains to be cured, that is, to be dilated or sawed or cut, and in the belief that, after all, direct dilatation with the attendant and consequent pressure absorption, whether induced by sounds, electrolysis, laminaria pencils, or what not, is at last our only really curative resource in stricture of the œsophagus, the writer submits for consideration photographs and descriptions of new instruments for the direct dilatation of œsophageal stricture, and, while he certainly does not wish to dogmatize upon so important a subject, submits further herewith his belief that by their use a certain percentage of so-called impassable cicatricial strictures may be entered and dilated, and the use of ordinary œsophageal bougies, laminaria pencils, and electrodes made possible

Persistent effort with these instruments has made it possible, in several cases of what had been pronounced by surgeons of varying skill and experience to be impassable strictures, to nourish the patient and cure the stricture without gastrostomy

It is very well known that whereas rectal alimentation and the use of a hernia pad after simple gastrostomy, as suggested by Taylor and others, may give some aid in sustaining the declining patient, it cannot be denied that a certain percentage of cases operated by simple gastrostomy for retrograde dilatation must succumb at length to starvation in spite of the most zealous efforts at maintaining nutrition, for the reason that after simple gastrostomy food cannot be easily retained in the stomach, but is expelled with each descent of the diaphragm

In the writer's experience, gastrostomy in cases of cicatricial stricture of the œsophagus has been useful as a step towards immediate retrograde dilatation of an impassable stricture at or near the cardia, and for the establishment of a water-tight valve-closed canal through which the patient may be fed while a stricture of the upper or middle portion of the œsophagus is being opened by direct dilatation

Gastrostomy, as a preliminary step in the application of such methods of treatment of gullet stricture as those of Ochsner and Abbe, is of course indispensable

In children the performance of gastrostomy is not without considerable danger, and their nutrition through a gastrostomy tube is difficult

Contrary to the experience of others, the writer has found it easier to dilate œsophageal strictures in infants and small children than in larger children and nervous and rebellious adults

In most cases of cicatricial stricture, a gradual narrowing of the dilated segment above the stricture guides the entering bougie directly into and through the contracted lumen. It not infrequently happens, however, that cicatricial contraction so changes the relations that the lumen is not in the centre of the hypertrophied mass. Often the passage is not only narrow but devious

The extent of strictures in the transverse and long diameter is very variable. Many include the entire periphery of the organ, but others take in only part of it. In such strictures as obstruct the lumen of the gullet with a large irregular mass presenting great dilatation or sacculation above the stenosis, or those in which the lumen is displaced from the centre of the organ, the passage of instruments, except by chance, is often impossible

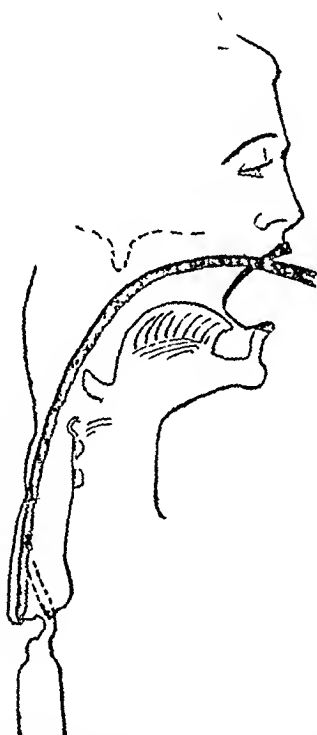
It is in the dilatation of strictures of this sort that a malleable or dirigible bougie offers a distinct advantage (Figs 6 and 7). The position in the gullet of a hard-rubber olivary-bulb dilator attached to a springy whalebone shank cannot be controlled by the operator. As will be clear when



FIG 5—High power showing Unna's plasma cells in muscularis

the shape and relations of the œsophagus are recalled, a bulb upon the end of a springy handle must pass along the posterior wall of the gullet in the upper segment and then across to the anterior surface as the lower extremity is approached. Cra-cour's spiral wire and metal-tip bougie and the English silk-web and gum dilators are open to the same objection

FIG 6



Illustrating advantage of malleable bougie in stricture of the œsophagus, cicatricial contraction having displaced lumen towards anterior wall

The surgeon occasionally encounters stricture of the œsophagus from a fold of the mucous membrane. There is such a specimen in the museum of the College of Surgeons, London.

Rokitansky (Path Anat, Vol 11, page 8) reported cases in which the mucosa had been destroyed by the energetic action of an escharotic and replaced by fibrous tissue, giving rise to peculiar valvular strictures of the œsophagus, somewhat analogous to those of the bowel consequent on dysentery.

It is unnecessary to multiply instances of these peculiar forms of contraction to show that in certain cases, at any rate,

a malleable bougie to which one may give any desirable curve and the direction of whose tip may be controlled will serve a useful purpose. These bougies are of spiral-wound steel wire, filed flat and smooth, and contain a withdrawable soft lead core. They are made in various lengths and diameters.

If a fold of mucosa or a transverse band of scar tissue upon the posterior surface of the canal obstruct the passage of the instrument, the tip may be curved so that it must pass along the anterior surface, and *vice versa*. The core is so soft as to practically eliminate the danger of trauma to the oesophageal mucosa or perforation. The malleable core is withdrawable, and may easily be removed when the tip of the instrument has passed the stricture. The lead core makes it possible to readily determine the position of the sound while in the oesophagus by the use of the X-ray. The skiagram (Fig 8) showing the metallic dilator occupying the oesophagus was made to determine whether the instrument really passed the stricture in this case and entered the stomach. Insomuch as it was not possible to enter the strictured segment with dilators other than one screwed to the butt of a filiform, a question arose as to whether the dilator did not merely coil up in the sacculum above the stricture. The X-ray promptly cleared up this doubt. This could hardly have been decided so easily had the dilator not been constructed of metal.

A large sound of this type may occasionally be readily passed through a strictured lumen which does not permit the entrance of very small ordinary bougies in skilful hands.

One of these instruments is shown in Fig 9. Several filiforms, fifteen inches long, of the sort also shown upon this plate, are introduced into the oesophagus, some bent, some twisted cork-screw-like, some straight. In most cases of stricture, after to and fro and twisting manipulation of these filiforms, one after another for a longer or shorter time, one will slip through the strictured segment. The other filiforms are then withdrawn. The spiral-wound flexible metallic bougie may then in many cases be introduced by screwing its small threaded end to the threaded butt end of the filiform and push-

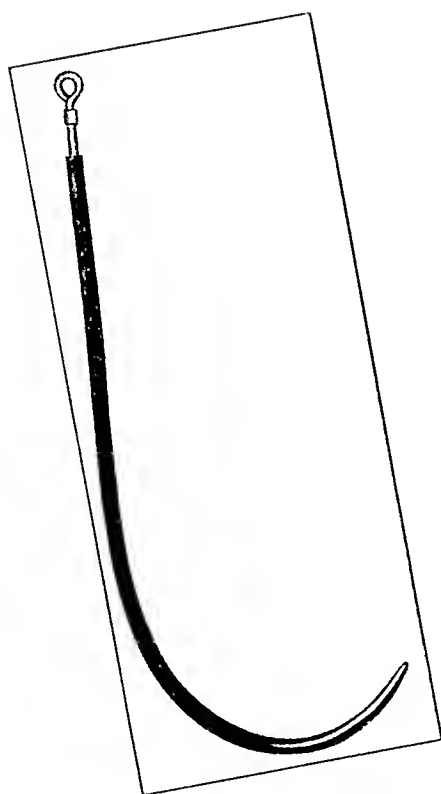


FIG. 7.—Soft malleable esophageal bougie of web silk containing within variable lead core

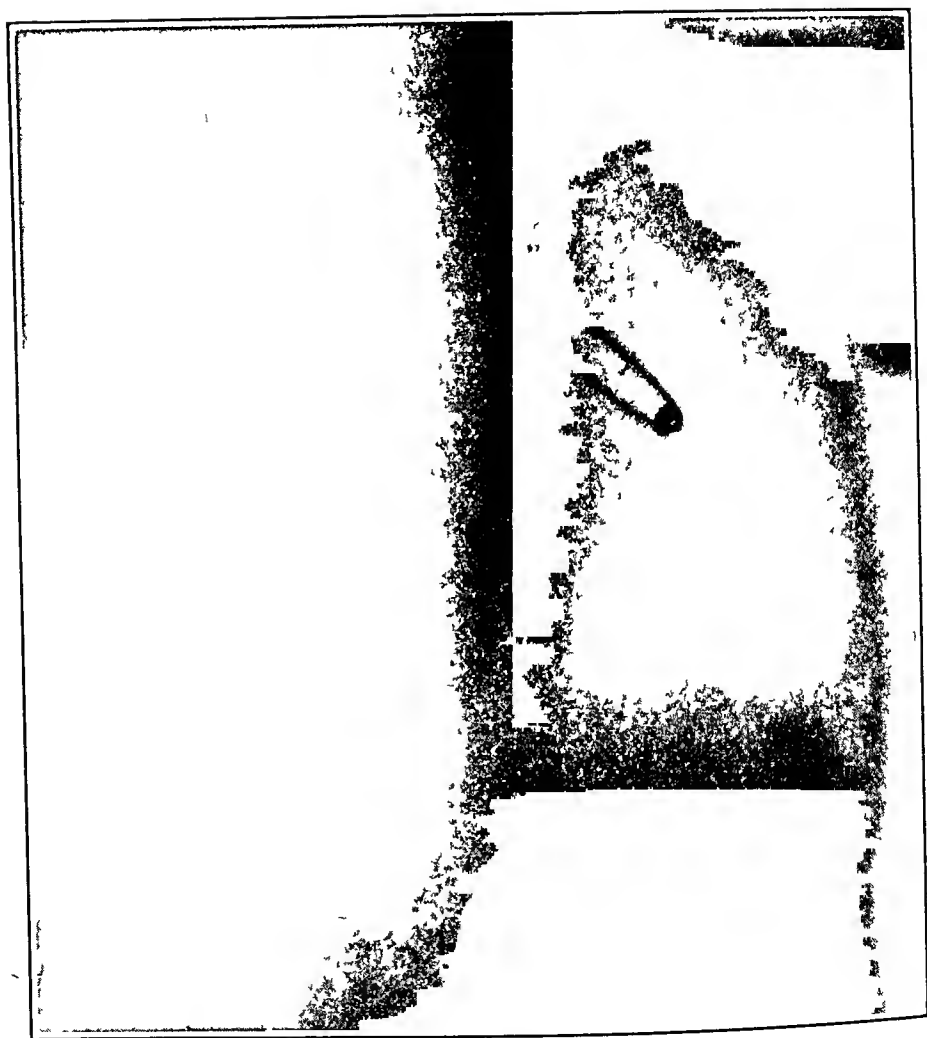


FIG. 8—Sialograph showing author's spiral wound wire dilator in strictured sialophagus (attached to filiform guide). The picture is taken from the back, therefore shows liver upon the right side. The normal curves of the sialophagus are described by the bougie.

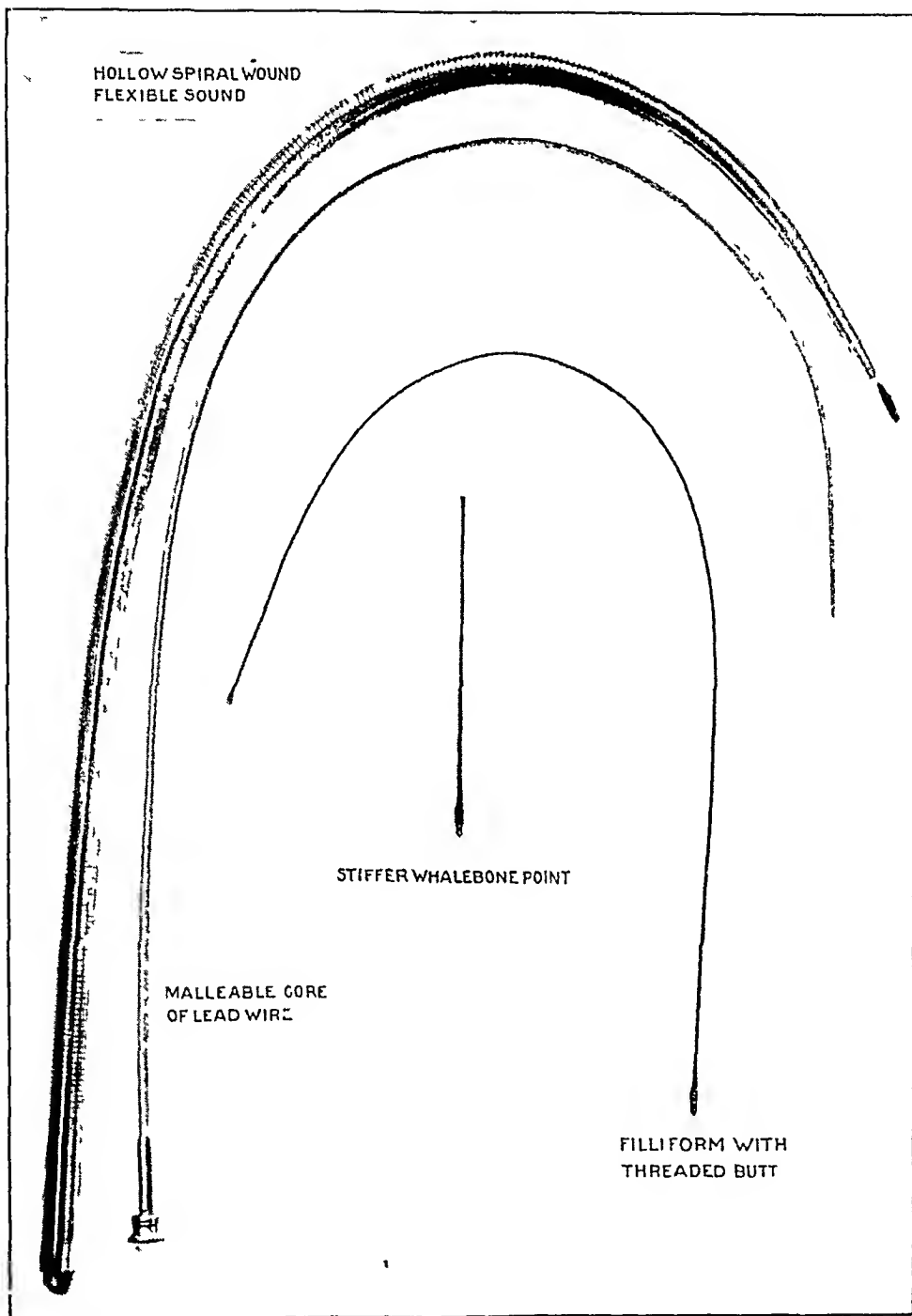


FIG. 9 —Wound wire malleable bougie and whale bone guides

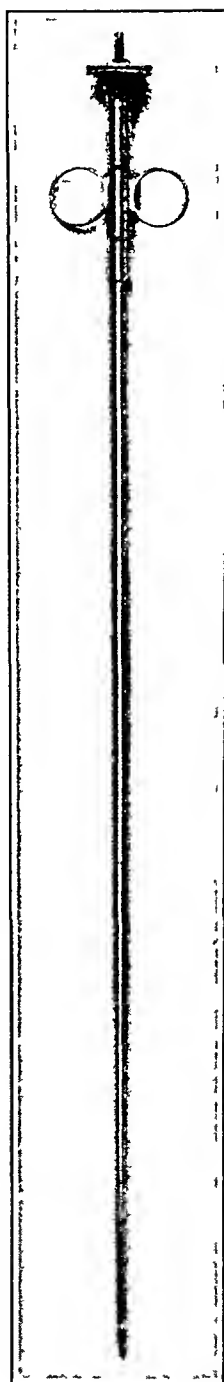


FIG 10 —Flexible double-metallic esophageal bougie

ing it gently into the œsophagus with or without the lead core, according to the resistance offered by the stricture. The filiforms, being soft and flexible, curl up in the stomach with no trauma to the gastric mucosa.

The writer is at present dilating a valve-like stricture of the œsophagus in a boy two years of age, in which after months of regular dilatation it is not possible to introduce any other instrument than one of the kind just described. In this case, after manipulation of the filiforms for a few minutes, one can always be made to engage the stricture and pass readily into the stomach. A relatively large-sized metallic bougie attached to the butt end of the filiform will readily follow the latter through the œsophagus, the filiform curling up in the stomach.

The shorter and stiffer filiform point shown in Fig 9 has been successfully used to guide the metallic dilator through a tight stricture at the level of the diaphragm. In this case a gastrostomy and unsuccessful attempt at rapid retrograde dilatation had been made. Under gradual direct dilatation, this stricture is yielding. The patient swallows readily fluids and semisolids after three months of sounding. In Fig 9 is shown a short hard-rubber tip which may be screwed to the threaded hollow end of the metallic bougie when the latter is to be used as an ordinary sound. To render the instrument malleable, the lead-wire core is introduced.

The writer has also fashioned a dirigible sound (Fig 10), the distal end and tip of which may be moved at will, while the instrument lies in the œsophagus, by the manipulation of an adjustment screw at the proximal extremity. This is made of two tapering bands of watch-spring steel welded together at the distal extremity or point. They are covered by flat wound wire. One of these bands is fixed to the handle of the instrument near the adjustment screw, the other band is attached to a half and full-round threaded bar which passes through the screw. By manipulation of the adjustment screw, the second band can be made to slide along the first, forward or backward, so as to move the tip in either of two directions. With this

instrument, which is light and quite flexible, it is possible to explore the bottom of a sacculum and enter an œsophageal lumen which would otherwise be difficult to discover

Bulbous sounds for the œsophagus are open to such objections as apply to bulbous sounds generally. Like the urethral "bougie-à-boule," they are useful in locating strictures, but are of little value as dilators. It is almost impossible to cause a bulb to lie in the grasp of a small stricture. It may be brought without difficulty to the proximal margin, and may be pushed to the distal side, but is only with great difficulty held in the contracted segment. It is not easy to secure with them the absorption produced by continued gentle pressure.

The swallowing of weak cocaine or adrenalin solution will usually, by virtue of the vascular depletion produced by those agents, facilitate the introduction of any œsophageal sound. The cocaine solution will also in most cases relieve nausea and prevent spasmodic and violent reversed peristaltic efforts, which may render the passage of instruments wellnigh impossible in an otherwise passable stricture. The local anæsthesia is also, for obvious reasons, of considerable value, especially in children.

We are generally advised to incline the head of the patient backward before introducing a sound. The writer has found it distinctly advantageous to enter the œsophagus with the head tilted forward. The tissues of the neck are more relaxed in the latter position.

Not all of the varieties of œsophageal stricture may be successfully treated by dilatation, yet it is doubtful whether the sound is not useful at some time in every case of cicatricial stricture.

DIVERTICULA OF THE ŒSOPHAGUS

WITH THE REPORT OF A CASE

BY ALBERT EDWARD HALSTEAD, M D ,
OF CHICAGO,

Professor of Surgery, Chicago Polyclinic, Attending Surgeon to the Cook County and
St Luke's Hospitals

THE term diverticulum is properly applied only to a circumscribed pouch-like protrusion or bulging involving a limited part of the circumference of the œsophagus, and should not include sacculated dilatation of the whole tube that occurs above strictures or from paralysis of its muscular wall. Neither should abscess cavities communicating with the lumen by fistulous tracts, nor defects in the wall from ulceration and cicatrization, which permit of slight sacculaton of the œsophagus, be included under this head. The characteristic features of a true diverticulum are that they are sharply defined, pouch-like protrusions of the œsophageal wall, lined with a normal or but slightly altered mucous membrane. Ulceration of the inner surface of the pouch is but rarely found. As a result of long-continued irritation from imprisoned foreign matter, degenerative changes with papillary or carcinomatous outgrowths sometimes occur.

As there is no sharp line of demarcation between the pharynx and the œsophagus, it would not be possible to consider diverticula of the œsophagus without discussing those of the pharynx. Among the cases reported in the older literature, many that would now be classed as pharyngeal were described as belonging to the œsophagus. This was in part due to the inaccuracy of the observer, and in part to the uncertainty as to what constitutes the lower limits of the pharynx. Again, by far the greater number of diverticula have their point of origin at the junction of the pharynx and œsophagus, and may with propriety be considered as belonging to both.

The difficulty in determining whether these border-line cases properly belonged to the pharynx or œsophagus led Starck to group them as pharyngo-œsophageal, and Rosenthal as "Grenz" diverticula. The anatomical landmarks by which the pharyngo-œsophageal junction may be determined are still a matter of dispute. The older writers were satisfied to consider the point at which the respiratory and alimentary tracts became distinct as indicating the beginning of the œsophagus. Others consider that the characteristic arrangement of the musculature, the inner circular and the external longitudinal layers, indicate the termination of the pharynx and the beginning of the œsophagus. By some the smallest part of the tube is considered the point of division. At the present time, most writers fix the upper limit of the œsophagus at a point corresponding to the lower border of the cricoid cartilage. As all of these are subject to considerable variation, it is therefore difficult, excepting after the most painstaking investigation, to determine the starting-point of some diverticula. For all practical purposes, the pharyngo-œsophageal junction may be considered as on a level with the lower border of the cricoid cartilage. This point will also in most cases mark the narrowest part of the tube. In children the upper limit of the œsophagus is slightly above this, while in the aged the œsophagus may be dragged down so that it is considerably below the cricoid cartilage.

The history of diverticula of the œsophagus dates from the publication of a paper by Mondiere,¹ in which we find the first accurate description of this condition.

Following this publication, Rokitsansky, in 1840, classified them from an etiological stand-point into two groups. First, those that are due to traction from without exerted upon a portion of the œsophageal wall, and, second, those that result from pressure from within. The first group he called traction and the second pulsion or pressure diverticula. This classification has been followed by all writers since his time, and his work, dealing mostly with the first group, has up to the present time constituted our chief source of knowledge of traction diverticula. Zenker² was the next to bring this subject into promi-

nence His contribution, based upon the study of thirty-four cases, of which twenty-two had come to autopsy, constitutes a fountain from which all subsequent writers have freely drawn In this masterly work we find the first careful study of the pathogenesis and symptomatology and clinical significance of pressure diverticula

Since the publication of Zenker's work many contributions to this subject have appeared The most important of these are the theses of Oekonomides,³ Starck,⁴ and Rosenthal⁵ The latter is by far the most complete contribution to this subject that has appeared since Zenker's work was given to the profession

Following the classification of Rokitansky, Zenker described but two groups Traction and pressure diverticula A third distinct and important group has been added by Oekonomides,—the traction-pressure diverticula In this form we have a traction diverticulum enlarged by pressure from food accumulating within its cavity, causing it to acquire a pathologic importance equal to the pressure diverticulum described by Zenker

Little importance is ascribed by Rokitansky, Zenker, and their followers to traction diverticula In most cases they seem to cause no symptoms during life by which they can be recognized, and are only rarely found post-mortem A more careful examination of the œsophagus would undoubtedly show them to be more common than the autopsy reports of the past would indicate Traction diverticula are generally the result of traction made by the shrinkage of scar tissue that is attached to the œsophagus The contraction commonly follows an inflammation originating in a bronchial lymph gland at or near the bifurcation of the trachea It may also be the result of an inflammation spreading from the pleura or pericardium to the œsophagus and its surrounding areolar tissue, or through the pleuro-œsophageal muscle of Hyrtl This mode of origin explains their situation on the anterior wall of the œsophagus, and also their frequency in children and in tubercular subjects They are generally small funnel-shaped recesses, having for

their wall either all of the tunics of the œsophagus or its mucous membrane alone. Their direction is, according to Zenker, mostly horizontal or oblique, with the orifice of the pouch directed downward. The direction of the lumen of the sac, with the slight chance afforded for arrest and retention of food particles, explains the absence of the clinical symptoms common in pressure diverticula.

In a case reported by Chiari,⁶ a traction diverticulum developed from contraction of the scar tissue connecting a degenerated goitre with the œsophagus. A few cases undoubtedly have been observed where no scar tissue or evidence of an antecedent inflammation could be demonstrated. These are to be explained by the presence of the tracheo-œsophageal and pleuro-œsophageal muscle, that binds together the œsophagus and trachea and the œsophagus and pleura. The presence of this muscle with unequal displacement of the trachea and œsophagus could, by producing traction upon the œsophagus, cause a diverticulum at its point of attachment. Inflammatory processes, spreading from the trachea, bronchi, or the pleura, to these muscles, may also from subsequent contraction be the cause of a diverticulum, as was shown by two specimens examined in serial sections by Riebold.⁷ Although traction diverticula are generally regarded as of slight importance, they may by perforation of the diverticular wall become a serious menace to life. Rokitsansky recognized this danger, and reported a fatal case of perforation of a diverticulum. When perforation occurs, it is either from a sharp foreign body lodged within or through ulceration from pressure or retained food. A case is reported by Coester,⁸ where the sac was penetrated by a sharp spicule of bone which entered the vena cava and caused a fatal hæmorrhage. Other cases are reported in which the aorta and vena cava have been injured by sharp bodies lodged in a diverticulum. Zenker reports two cases, one of his own and one of Merkle's, in which sudden death was caused by penetration of the pulmonary artery by sharp pieces of bone that had lodged in a traction diverticulum. Death may also be the result of perforation of a diverticulum with subsequent infec-

tion of the mediastinum, pleura, or pericardium. In fact, when death results from the presence of a traction diverticulum, it is generally from infection of the mediastinum or from a gangrenous pneumonia. Occasionally a bronchus is perforated, causing a fatal septic bronchitis. Zenker mentions a case of a woman sixty-six years of age who died of an obscure disease. The autopsy revealed a double gangrenous pneumonia, with a perforation of the right bronchus, communicating with an abscess of the mediastinum, into which, on the opposite side, opened the diverticulum of the œsophagus.

Aside from the dangers incident to perforation of a traction diverticulum, in a few cases they become of great clinical importance by being converted into pressure diverticula from the arrest of food particles and the consequent distention of the sac from pressure and traction. This occurred in eight of 133 cases of traction diverticulum, according to Rosenthal. To this group Oekonomides has given the name of traction-pulsion diverticula. They are situated, as are traction diverticula, on the anterior wall of the œsophagus, and generally near the bifurcation of the trachea. Unlike the latter, however, they are of the greatest clinical importance, and give rise to symptoms quite as distinct, when of the same size, as those that are primarily caused by pressure. Of this group Rosenthal was able to find nine cases reported in the literature, the first being by Tiedemann, in 1875. In three of these the sac was of large size, from four to seven centimetres in depth, and pear- or egg-shaped, resembling in structure pulsion diverticula. In one (Tetans⁹) the orifice of the sac was three and one-half centimetres below the cricoid cartilage, and in a second the fundus was found the same distance above the cardia.

Traction diverticula which are always of small size cause no symptoms during life by which they may be recognized. Difficulty or delay in swallowing granular foods, such as rice or corn, may be sufficient to attract attention, according to Tiedemann¹⁰. If the sac causes the arrest of food, it soon becomes enlarged, and is then a traction-pulsion diverticulum with the symptoms in the main of a pulsion diverticulum. Dys-

phagia, however, has not been an early symptom in the cases reported. In the case of Scherpenburg,¹¹ pressure of the sac upon the left subclavian produced a change in the volume of the left radial pulse. Regurgitation, vomiting, dyspnoea, and pain from pressure when the diverticulum is filled are symptoms common to this group and to pressure diverticula. Death from inanition is almost a constant termination in traction-pulsion diverticula. Relief from surgical procedures is impossible on account of the deep location of the sac.

Pressure or pulsion diverticula, unlike those caused by traction, always produce symptoms by which they may be recognized during life. Although not so common as the latter, they are of far greater interest to the practitioner. First, because of the difficulty encountered in making a correct diagnosis, and, second, because the condition, if not relieved by surgical means, will ultimately destroy the life of the patient. Of the twenty-seven cases reported by Zenker, in which the diagnosis was verified by autopsy, thirteen died from starvation and eight from intercurrent diseases, superinduced by the diverticulum. In six the cause of death was not mentioned in the report.

For convenience of description, and because of the difference in the clinical importance, mode of development, and variation in the symptoms produced, pressure diverticula may be grouped into

- 1 Those of the pharynx proper
- 2 Those at the pharyngo-oesophageal junction, the borderline cases, or Grenz diverticula of Rosenthal
- 3 Diverticula having their origin in the middle third of the oesophagus somewhere near the bifurcation of the trachea, and mostly just above the left bronchus. This is the epibronchial group of Leutgert.¹²
- 4 The deep-seated diverticula, those in which the origin is below the level of the left bronchus, with fundus a variable distance above, but usually near, the diaphragm. These have been termed epiphrenal diverticula, because most of them are given off from the oesophagus a short distance above the dia-

phragm with the fundus of the pouch resting upon it. These diverticula of the first group are found mostly on the lateral wall of the pharynx and rarely on the posterior median aspect, as are those of the pharyngo-œsophageal junction. Most lateral pharyngeal diverticula are congenital, probably originating from the remains of the third and fourth branchial clefts, the starting-point being an incomplete internal branchial fistula that has from pressure from within gradually dilated and assumed the characteristic shape of a diverticulum. Koenig and Es-march considered this to be the mode of origin of all diverticula of the pharynx and also of the pharyngo-œsophageal region. While the possibility of an internal fistula offers a plausible explanation of the first group, it must be admitted that it has never been conclusively demonstrated by dissection. In these cases in which the symptoms of a diverticulum date from early childhood, it is possible that the presence of a congenital defect will explain their early onset. This defect may be either an internal branchial fistula or a congenital pouch-like recess in the posterolateral pharyngeal wall, such as occur normally in certain lower animals, *e g*, the pig, camel, and elephant. Congenital stenosis of the œsophagus may also be the cause of the early symptoms, and may be an important factor in causation of a diverticulum.

In the case reported by Heusenger,¹³ in which the symptoms began in early childhood, the position of the sac would make it appear as if the diverticulum originated in a branchial fistula. In this case the patient, a man aged sixty-seven years, had suffered from earliest childhood from dysphagia and regurgitation of food. On examination, no difficulty was found in passing a sound into the stomach. The finger could be passed into a sac which lay to the right of the base of the tongue, and which contained a large quantity of mucus and remains of food taken some days before. By pressure upon the lateral walls of the pharynx, the pouch could be emptied. Another case similar to this in which the symptoms began in early life is reported by Bartelt.¹⁴ This case, although reported as a diverticulum of the œsophagus, probably was of pharyngeal origin.

Trauma, causing a weakening or rupture of the muscular wall of the pharynx, may be an important factor in the development of a diverticulum. In the case reported by Klose and Paul,¹⁵ injury to the pharynx by a fish-bone which lodged in the throat was considered by them to be the cause of the diverticulum. In this case the fundus of the sac lay four centimetres under the isthmus of the fauces on a level with the cricoid cartilage. The orifice was one and one-half inches higher behind the isthmus. The capacity of the diverticulum was about four drachms. Although the symptoms characteristic of a diverticulum dated from the time of injury in this case, their relation to the accident might be explained by assuming that a diverticulum or a congenital malformation existed at the time, and that the foreign body lodged within the cavity had first directed attention to its presence.

Excessive pressure within the pharynx from long-continued blowing on wind instruments, or from shouting, may, in case the pharyngeal wall is weakened from previous disease, cause a dilatation of a part of the pharynx that later, from accumulation of food, becomes a diverticulum. In others the pressure may cause a separation of the fibres of the pharyngeal muscles, and a hernia of the mucous membrane may result, which subsequently, from retention of food, may become a pulsion diverticulum. In a case reported by Wheeler,¹⁶ an officer, after an attack of erysipelas which involved the throat, gradually developed a tumor on the right side of the neck under the sternomastoid muscle, which increased in size when the pressure within the pharynx was increased, as in shouting. The voice was hoarse and uneven, and cough was troublesome. The patient was operated upon, and the sac, which was of mucous membrane alone and which pressed upon the right recurrent laryngeal nerve, was excised and the pharynx closed. Recovery with complete control of the voice followed.

The symptoms occasioned by lateral pharyngeal are on the whole similar to those of pulsion diverticula of the œsophagus. Dysphagia, however, is not so constant nor so troublesome as in the latter. Cough and dyspnoea from the contents of the

sac escaping into the air-passages, and from pressure upon the larynx, or upon the recurrent laryngeal nerve, have been the most characteristic symptoms in the cases reported. As a rule, the diverticulum does not obstruct the œsophagus to any considerable degree, and therefore the patient does not suffer from inanition, as in œsophageal diverticula.

Pharyngo-œsophageal pulsion diverticula are the most common as well as the most important from a pathologic and clinical stand-point. The etiology of many is yet unsolved. They develop exclusively in the median line posteriorly. At times from traction, as the sac grows larger and is compressed against the vertebral column, they are dragged to one side, usually to the left, the fundus being in relation to the lateral wall of the œsophagus. In the course of development of the pouch, the œsophagus is also displaced, so that the axis of the pharynx and the orifice of the diverticulum are in a line, permitting easy entrance of food into the sac and obstructing the lumen of the œsophagus. Their point of origin corresponds to a triangular space just below the inferior constrictor, where, by the separation of the longitudinal muscular bands of the œsophagus and the absence of circular muscular fibres, there is normally a defect in the muscular wall of the œsophagus. This point of least resistance in the œsophagus has been called the Lamer-Hackermann¹⁷ point. It is here that the separation of the muscular fibres takes place with the greatest ease. Above this the interlacing fibres of the superior constrictor and below the circular, inner, and the longitudinal outer muscular layers are capable of withstanding pressure from within. At this point the œsophagus is also narrowest and fixed in front by its relation to the cartilaginous larynx, so that any increase in pressure within its lumen must unequally distend its posterior wall. In case of arrest of an unusually large bolus of food or of a foreign body, it is this weak point that bears the impact. It is thus readily seen that a foreign body lodged here may separate the muscular fibres and produce a hernia of the mucous membrane, which later develops into a diverticulum. A number of cases are reported where the symptoms of a diverticulum followed close

upon the arrest of a foreign body, such as a piece of bone, in this part of the œsophagus. Aside from injuries from ingestion of large masses of food or a hard foreign substance, it is possible for lesions of the muscular wall of the œsophagus from trauma from without to be the immediate cause of diverticulum. A case of this kind is reported by Freiberg¹⁸. The patient, an officer, was thrown from his horse during some military manoeuvres and sustained an injury to the head, from which he remained unconscious for twenty-four hours. After regaining consciousness, a swelling was observed between the trachea and the sternomastoid muscle. He immediately complained of dysphagia, which gradually increased with the onset of other symptoms of a diverticulum, although the swelling disappeared. The symptoms of obstruction continued until death from inanition took place. As a result of the accident, a laceration of the wall of the œsophagus had occurred, which was immediately followed by the development of a pressure diverticulum.

A case similar to Freiberg's has recently been reported by Schlesinger¹⁹. In this the patient, a male of sixty-seven years, fell from a scaffolding fifteen years before he presented himself for examination. Immediately after the accident he experienced difficulty in swallowing, which later became serious. Œsophagoscopic examination showed the sac twenty-three centimetres from the incisor teeth. Measurements of the contents of the sac showed its capacity approximately 250 centimetres. The patient subsequently died from an acute pneumonia. Autopsy showed that the diverticulum had its origin at the pharyngo-œsophageal junction, and that its orifice was dragged downward two and one-half centimetres below the cricoid cartilage, and was seventeen and one-half centimetres from the line of the teeth. The sac measured six centimetres in both its vertical and transverse diameters. Its inner surface was somewhat eroded, and at one point a small warty excrescence was found, which, on histologic examination, proved to be carcinoma. Schlesinger considers that the fall caused a rupture of the œsophagus. This view is supported by the occurrence of a slight hæmorrhage at the time of the injury.

Cicatricial stricture of the Œsophagus, although but rarely associated with diverticula, yet occasionally bears a causal relation to this condition, as is shown by a few recorded cases. One of this kind is reported by Nicoladoni²⁰. A child of eight had two years before swallowed a solution of caustic soda which caused a stenosis of the Œsophagus. Shortly afterwards the characteristic symptoms of a diverticulum developed. To permit feeding, the Œsophagus was opened by lateral incision and a tube introduced into the stomach. The patient died eight days later of bronchopneumonia. The autopsy showed a cicatricial stricture of the Œsophagus just below the cricoid cartilage. Immediately above the stricture the Œsophagus was dilated, and from the posterior lateral wall a typical diverticulum was given off. A similar case was reported by Braun²¹.

Congenital strictures of the Œsophagus when found are often situated at the upper limit of the Œsophagus. When the symptoms of a diverticulum of this region date from early childhood, the presence of a congenital narrowing of the Œsophagus offers the most rational explanation of their origin. An interesting case of a diverticulum that was situated immediately above a non-traumatic stricture is reported by Richardson²². In this a typical pulsion diverticulum, the size of a hen's egg, was found above a stricture of the upper part of the Œsophagus, that had narrowed its lumen until it had the diameter of a lead-pencil. The mucous membrane appeared thickened and granular, but showed no scar tissue nor ulceration. The muscular wall of the Œsophagus at the site of the stricture remained unchanged. The normal character of the tissue at the point of stricture would point to a congenital origin. Cases in which a diverticulum was found above a congenital stricture, and which from the description would appear to be similar to Richardson's case, are reported by Cassan²³ and by Bauernfeind²⁴. In the latter a stricture that admitted a sound only six millimetres in diameter was found at the level of the first tracheal ring. The absence of scar tissue and infiltration proved it to be of other than inflammatory origin. Above this constriction a sharply defined sacculaton, three and one-half centimetres deep,

was found In Cassan's case difficulty in swallowing dated from early childhood This, with the absence of cicatricial tissue, proved the stricture to be congenital

Diverticula situated between the pharyngo-oesophageal junction and the upper border of the sternum are rare, and are probably all of the traction-pulsion group, which have already been considered Below this, at the level of the left bronchus, there occur occasionally diverticula which are etiologically distinct from the pulsion diverticula of Zenker These are the epibronchial diverticula of Leutgert He considers that the anatomical relations of the oesophagus and left bronchus at this point explain their origin, and also determine the frequency of the development of carcinoma in this part of the oesophagus On examining the oesophagus when removed with the lungs and bronchi intact, Leutgert found that the left bronchus, where it crossed the oesophagus, caused a distinct bulging-in of the anterior oesophageal wall Above this there is a more or less distinct recess, varying in different specimens from a slight depression to a pocket deep enough to contain the tip of the index-finger In children this was not found He believes the obstruction caused by the left bronchus to be sufficient to temporarily arrest the food, which, under certain conditions, such as the presence of an abnormally large bolus, may deepen this epibronchial pocket, and thus cause a diverticulum

Diverticula of the lower third of the oesophagus are mostly situated just above the diaphragm, and for this reason have been termed epiphrenal The etiology of this group is not yet clear Some of them at least are traction-pulsion diverticula, although there are but few glands in close relation to this part of the oesophagus In the cases reported, the diverticula were mostly found given off from the lateral or anterior wall of the oesophagus, differing in this respect from those higher up Tetans describes a case in which the fundus of the sac reached to within a few centimetres of the cardia In the neighborhood of the diverticulum were found pigmented lymph glands, but no cicatricial tissue connecting them with the diverticulum He regards the diverticulum as belonging to the traction-pulsion

group A deep-seated diverticulum of the anterior wall of the œsophagus is described by Oekonomides At the autopsy of a woman who died at the age of eighty-three, a diverticulum the size of a small apple was found, eight and one-half centimetres above the cardia, anterior and somewhat to the right of the œsophagus The sac contained no muscular fibres, and was lined with normal mucous membrane The absence of fibrous tissue or degenerated glands led to the belief that this was primarily a pressure diverticulum No explanation of its origin was given

Besides the traction-pulsion diverticula of the lower part of the œsophagus, there are a few that are probably due to a constriction of the œsophagus at a point where it passes through the diaphragm This constriction may be a cicatricial stenosis of the œsophagus, or may be due to a congenitally narrow opening in the diaphragm

The appearance of a typical pressure diverticulum, as found at the pharyngo-œsophageal junction, is that of a sharply defined protrusion of a portion of the wall of the œsophagus The size varies from a pea to that of a pear They are pear-shaped or cylindrical, with an orifice considerably smaller than the circumference of the sac The larger ones have a thick wall resembling on superficial examination the wall of the œsophagus In the smaller ones the structure is that of a thin translucent pouch In none of the typical pulsion diverticula do we find a complete muscular layer The sac, even in the largest, is made up of mucous membrane covered by a layer of connective tissue Near the neck of the sac there are found muscular bands which have been drawn down from the lower fibres of the inferior constrictor Diverticula of the lower end of the œsophagus do not contain any muscular tissue Those of the pharynx and the traction-pulsion diverticula may have a complete muscular layer The mucous membrane rarely ulcerates but frequently is thickened from papillary hypertrophy of sub-mucosæ Long-continued mechanical and chemical irritation, resulting from the retained ingesta, is sufficient to cause primary carcinoma of the diverticular wall Cases in which carci-

noma was found are reported by Riebold, Quinset, and Grashius

The symptoms occasioned by diverticula of the œsophagus are generally identical in the beginning with those of a gradually increasing stenosis which, at times extends over a number of years. Most of those described have been in persons of advanced years, generally over fifty. In those in whom the dysphagia dated from early life, congenital stenosis probably occasioned the first symptom, to which later were superadded those of diverticulum. In Rokitansky's²⁵ case, in which the symptoms lasted for forty-nine years, the early difficulty in swallowing was probably due to an obstruction caused by the pressure exerted by a goitre. In the development of the diverticulum, as soon as the bulging mucous membrane is enlarged, so that a distinct sac is formed, the ingesta entering with each act of swallowing will be longer and longer detained, since the sac, being formed of mucous membrane alone, has no power of emptying itself, and will gradually enlarge from the pressure from within. The symptoms at first are usually only those of a slight stenosis. The more severe and characteristic symptoms begin when the sac is of sufficient size when full to compress the œsophagus and occlude its lumen, or by its weight to change the direction of the axis of the œsophagus, so that the orifice of the diverticulum is in direct line with the axis of the pharynx. The diverticulum now becomes filled at the beginning of a meal and compresses the œsophagus, preventing any food entering the stomach. Anything taken after this lodges in the pharynx and is soon thrown out again. In some cases, in the early stage of development, if the sac becomes filled, the food subsequently taken passes into the stomach unhindered. That contained in the sac is later ejected, establishing a condition simulating rumination. This symptom is quite characteristic of a diverticulum, although it also occurs in diffuse dilatation of the œsophagus.

In a case reported by Neukirch,²⁶ the patient was able to take food only when in the reclining position. In other cases the food lodged in the sac may remain many hours or days,

and can only be removed by pressure upon the neck or by contraction of the muscles of the neck, or by the act of vomiting. In case of deep-seated diverticula, food taken several days previously may be ejected from the sac, while that taken in the interval is not returned. The food which is ejected from the diverticulum is mixed with mucus and softened, but is never digested, nor does it contain any of the juices of the stomach.

In diverticula of the upper end of the œsophagus the sac, which nearly constantly contains mucus and food débris, empties itself partially or wholly when the patient assumes the reclining position. The semifluid contents escape into the air-passages and bring on severe attacks of coughing or dyspnœa. A patient suffering from a diverticulum in this part of the œsophagus soon learns that in order to secure rest he must empty the sac before going to bed.

Pain after eating is usually a symptom if the diverticulum is of sufficient size to cause obstruction by pressure. This pain usually continues until the sac is empty. It is deep-seated and retrosternal. In a case of diverticulum of the lower end of the œsophagus reported by Jung,²⁷ the patient suffered from violent colicky pains in the epigastrium immediately after taking food of any kind. These pains were at first relieved by vomiting, but later were not. Pain of this character is more significant of spasm of the cardia than of a diverticulum. It must, however, be borne in mind that some deep-seated diverticula are associated with dilatation of the œsophagus and spasm of the cardia. This second case reported by Jung, in which a violent cramp-like pain was also a prominent symptom, would appear to be of this nature. In diverticulum of the cervical portion of the œsophagus a diffuse or circumscribed tumor of the neck, perceptible by inspection or palpation, may be an objective sign that permits of a positive diagnosis. Pressure upon this tumor will force food from the sac into the mouth and will cause the tumor to disappear. In cases where no tumor is recognized, pressure upon the neck behind the sternomastoid may empty the diverticulum and force its contents into the mouth.

The diagnosis of diverticulum of the œsophagus is based mostly upon the clinical history, the subjective symptoms above mentioned, and upon the evidence obtained by the use of the sound. The skiagraph may be employed with positive results in a few cases by filling the sac with bismuth mixture, or by introducing a metallic sound or rubber tube filled with shot. By this means the depth and position of the sac may be ascertained, which is of importance in deciding upon the advisability of an operation. In a diverticulum high up in the œsophagus and in diverticula of the pharynx, the use of the œsophagoscope gives positive findings. In the deep-seated diverticula its value in making a diagnosis is slight. Transillumination has also been employed, but with limited success. In the sound we have a means of examination if properly employed, that will permit of a nearly certain diagnosis. In many cases upon attempting to pass a moderate-sized or small sound we find it meets with an obstruction which first appears to occlude completely the œsophagus. Often in changing the position of the patient, as by throwing the head far back or to one side, the obstruction is easily overcome, and the sound passes into the stomach unhindered. In other cases, as in ours, we may not be able to pass a small or moderate-sized sound, while a large-sized sound will easily slip through. In still another class of cases, at certain times all sizes may be passed with ease, while at other times neither large nor small sounds can be introduced.

Rumpel²⁸ has made use of two stomach-tubes to differentiate between diverticulum and dilatation. This method, as improved by Jung, offers the best means, when carefully employed, of recognizing diverticula, particularly those of the lower end of the œsophagus. Rumpel employed two tubes,—one, with numerous perforations in its lower end, is passed directly into the stomach, the other, with but a single opening at the end, into the œsophagus above the cardia. Water, if poured through the second tube, will run down into the stomach through the opening in the first in case of dilatation. If a diverticulum exists, it will first be filled, and if the overflow will reach the stomach, the contents of the diverticulum can be returned to the second tube and measured.

The chief obstacle to this procedure is the introduction of the first tube into the stomach. In some cases of diverticula this is impossible, and in extreme cases of dilatation it is frequently difficult. Jung employs two tubes in the same manner as Rumpel. In addition, he introduces a third smaller tube, with only two perforations at the end, through the first or stomach-tube. By this means he is able to aspirate the fluid from the stomach, which gives positive information as to the position of the tube. With Rumpel's perforated tubes alone no fluid can be withdrawn from the stomach, thus making it impossible to ascertain definitely if the stomach has been entered. By allowing clear water to pass into the stomach through the first tube and a colored solution through the second, and by having the water returned unmixed with the colored solution from the inner or third tube, a positive diagnosis of diverticulum can be made, and dilatation of the œsophagus with or without cardia spasm can be excluded.

In non-malignant stricture of the œsophagus, if a sound be passed into the strictured zone, no mobility of the sound is possible, while in a diverticulum, if the sound be passed into the sac, although it cannot be pushed farther down, a considerable degree of lateral mobility is possible. This procedure is sufficient to differentiate simple stricture from diverticula.

The treatment of œsophageal diverticula may be either non-operative or operative. Of the latter, we have the palliative and the radical operations. The first case in which systematic efforts were made to cure the patient was treated by Dendy,²⁹ who attempted to obliterate the sac by injecting into it a strong solution of nitrate of silver. This proved disastrous, and has not since been attempted. In the persistent use of the sound- and stomach-tubes we have the only means of palliative treatment worth considering. This method has, with more or less success, been practised by Berkhans,³⁰ Bruns³¹ and Schede³². In Berkhans's case the patient remained comparatively well for nineteen years. Neukirch was able to feed his patient through the stomach-tube by placing him on the right side in a reclining position. After the use of sounds and tube

for some time, the symptoms greatly improved Waldenberg³³ and Schede employed a faradic current applied to the oesophagus near the orifice of the sac and to the diverticular wall, with improvement in the general condition of the patient and diminution in the size of the sac In Schede's case the sac shortened three centimetres in four years Although temporary relief may be had in a few cases by the use of the sound, this method of treatment is not free from danger, and can be employed only in a few cases, because of the difficulty in introducing the sound The chief danger is perforation, which can readily occur, owing to the extremely thin wall of the sac and to the act of vomiting which the presence of the sound may excite A fatal perforation from the use of the sound occurred in the practice of Bruns

The palliative operation of gastrostomy designed to relieve the symptoms, or rather to prevent death from starvation, was first practised in 1877 by Shonborn³⁴ The same method was employed by Whitehead,³⁵ Koenig,³⁶ and Chavasse³⁷ This operation is only indicated where there is no possibility of removing the sac, as in deep-seated diverticula, or where the patient's condition is such as to preclude the possibility of a successful radical operation

The method of treatment of diverticula by excision of the sac was first suggested by Kluge³⁸ in 1864 The first to attempt removal of the sac was Nicoladoni He did not succeed, but opened the sac and sutured it to the skin Death from pneumonia followed on the eighth day Bergmann³⁹ in 1890 performed the first successful excision of the sac In 1900 Veiel⁴⁰ was able to collect twenty-three cases operated on, including one of his own Of these five died and eighteen recovered The causes of death assigned were suppression of urine, diarrhoea, bronchopneumonia, and erosion of the superior thyroid artery In one case the autopsy did not reveal the cause of death

The technique of the operation for incision of the sac is, with slight modifications, the one first suggested by Hamburger⁴¹ in 1871, several years before the first operation was

performed In all of the cases operated on a skin incision was made along the anterior border of the sternomastoid muscle, by dull dissection the œsophagus is reached No vessels of any importance are encountered excepting the superior thyroid vein In one case the superior and second inferior thyroid arteries were ligated The normal thyroid gland can be drawn aside and is not in the way In a case in which the thyroid was enlarged, Bruns found it necessary to remove the lateral lobe in order to reach the diverticulum The sac has been removed both by cutting and by thermocautery The latter method has not given good results The necrosis following its use prevents speedy union of the cut edges The most important step in the operation is the closure of the opening in the œsophagus At the present time nearly all operators advocate the immediate closure of the opening by sutures, although Bergmann believes it scarcely possible to secure primary union

Various methods of suturing the œsophageal opening have been employed It would appear that the most satisfactory result would be obtained by first passing around the neck of the sac a purse-string suture Second, distal to this temporary ligature of the neck of the sac Third, abscission of the sac beyond the ligature Fourth, invagination of the stump, and tying the purse-string suture Fifth, suture of the neck of the sac with catgut, using the Lembert suture Sixth, closing the defects in the muscular wall of the œsophagus by suture preferably of silk

Berger ⁴² only partially closed the opening by suture and introduced a stomach-tube This procedure is not to be considered, as the presence of the tube in the œsophagus induces vomiting and subsequent leakage, with certain infection of the wound Several operators, among them Richardson Bruns, and Kocher, ⁴³ have succeeded in obtaining primary union of the whole operation wound In two cases a preliminary gastrotomy has been performed in order to nourish the patient during the course of the healing of the wound Girard ⁴⁴ in 1895 devised an operation for the radical cure of diverticulum of the œsophagus by invaginating the sac into the œsophagus and

closing the defect in the muscular wall of the œsophagus by suturing. He operated on two patients by this method. In one the result was ideal, in the other a fistula followed, which later closed. By this method the œsophagus is not opened, and therefore the risk of infection is but slight. It can only be employed when the sac is of small size, and when the lumen of the œsophagus below the neck of the diverticulum is of normal size.

The following case was referred to me by Dr J. E. Best, of Arlington Heights, Illinois, and treated by this method.

Mr. W., aged seventy-six years. Present trouble began seventeen years ago, with difficulty in swallowing solid food. For a number of years this was the only trouble experienced, excepting that sometimes after meals food swallowed during the first part of the meal would be returned to the mouth and again swallowed. He also noted that the first food taken appeared to lodge in the upper part of the throat, at a point apparently just below the larynx. As the years passed the symptoms of obstruction became more pronounced, so that about two years ago it became impossible for him to take solid food of any kind. Since that he has been forced to subsist upon liquids, which have been taken with increasing difficulty up to the present time. A few months ago he noted that liquids taken while in the reclining position seemed to be swallowed with less difficulty and to remain in the stomach. At the present time, anything taken while in the upright position is immediately regurgitated. During the last few months he has rapidly lost flesh and strength, and employs most of his time in endeavoring to swallow sufficient liquid nourishment to maintain life. This is accomplished by taking a few drops at a time. After taking food, there is considerable pain, which is referred to the neck above the upper border of the sternum. This pain is relieved by vomiting or by compression of the sides of the neck with the hands, which forces the food previously taken into the mouth. At no time has any blood been vomited.

Examination—There is a considerable degree of emaciation, chest and abdomen negative. No enlargement of cervical glands. No tumor can be seen or palpated in the neck. On giving water to drink, a small quantity, about thirty cubic centi-

metres, is retained. Any taken after this is regurgitated. Pressure upon the neck made below the larynx and behind the sternomastoid muscles will force the water previously taken back into the mouth. At times, without drinking water, a quantity of mucus can be forcibly thrown into the mouth by pressure made in the same way. If the mouth is opened and sudden pressure made, as described, the mucus or water may be forced from the mouth.

On attempting to pass a small-sized (1.25 centimetres) olive-tipped bougie, there is an obstruction met just behind the larynx at a distance of seventeen and three-quarters centimetres from the incisor teeth. Below this point the bougie cannot be passed, but it can be moved from side to side for some distance. At the time of the first examination, no bougie could be made to pass this point. At a later examination a larger-sized tip (two and one-half centimetres) was employed, and this passed readily down into the œsophagus. At times this large-sized bougie could be introduced without any difficulty, at other times it could not be made to enter farther than a distance of seventeen and three-quarters centimetres. At no time could the ordinary stomach-tube be made to pass into the stomach.

The patient was given a bismuth mixture to drink, and a radiograph of the neck was taken. A fairly distinct shadow was to be seen just in front of the vertebra, and about half-way between the larynx, which was ossified, and the upper border of the sternum. Upon the history and the findings described, a diagnosis of a pulsion diverticulum at the pharyngo-œsophageal junction was made. On January 8, 1903, under chloroform anæsthesia, the patient was operated upon at the Chicago Polyclinic Hospital, Dr. Paul O. Owsley assisting.

An incision was made on the left side from the angle of the jaw to the sternoclavicular articulation anterior to the sternomastoid muscle. The superior thyroid veins and artery were divided between ligatures. Dull dissection through a perfectly dry field readily exposed the œsophagus. There was some difficulty experienced in locating the diverticulum. This was overcome by passing a bougie through the mouth into the pouch. By this means the diverticulum was lifted from its bed and brought to the side of the œsophagus. The diverticulum was pear-shaped and measured four centimetres in length and three

in width. It lay slightly to the left and behind the œsophagus. The neck of the sac was a trifle below the lower border of the cricoid cartilage. The sac was very thin and translucent. With the bougie in the œsophagus the mechanism of the obstruction caused by the diverticulum could be demonstrated. The lower border of the neck of the diverticulum acted as a valve, projecting into the lumen of the œsophagus. Upon introduction of the sound, it came in contact with this valve-like projection, which, upon further pressure, was forced down and completely obstructed the œsophagus, and directed the sound into the diverticulum.

The sac was readily freed from its attachments to the surrounding tissue. A purse-string suture of catgut was passed around the neck with the sound in the sac. The sound was then withdrawn and the sac inverted, and at the same time invaginated into the lumen of the œsophagus. The purse-string suture was then tied. Three sutures of catgut were then passed through the neck of the inverted sac. These did not penetrate into the lumen of the diverticulum. Over these sutures, the longitudinal muscular layer of the œsophagus was united by interrupted catgut sutures. A third layer of chromicized catgut sutures transverse to these was introduced. By the latter the inferior constrictor of the pharynx was brought down, covering the first sutures. A large-sized bougie could be passed without difficulty into the stomach.

The skin wound was closed without drainage. For five days the patient was nourished by nutritive enemata. After this he was allowed milk, which he swallowed without difficulty. At the end of two weeks he left the hospital. Upon reaching home he ate heartily of solid food. Following this he suffered from a severe attack of acute gastritis, for which he was treated by Dr. Best, and from which he recovered. Since the operation he has not experienced any difficulty in swallowing any kind of food.

BIBLIOGRAPHY

¹ Mondiere Arch Gen de Méd, 1833

² Zenker Ziemssen's Encyclop of Med, 1878, vol viii

³ Oekonomides Inaug Dissert, Basle, 1882

⁴ Starck Inaug Dissert, Leipzig, 1900

⁵ Rosenthal Pulsionsdivertikel des Schlundes, 1902

- ⁶ Chiari Prag med Woch, 1884
- ⁷ Riebold Virch Arch, Band cxxviii, Heft 3
- ⁸ Coester Cited by Zenker
- ⁹ Tetans Inaug Dissert, Kiel, 1888
- ¹⁰ Tiedemann Cited by Rosenthal
- ¹¹ Scherpenburg Inaug Dissert, Erlangen, 1893
- ¹² Leutgert Pulsionsdivertikel oberhalb des linken Bronchus Inaug Dissert, Erlangen, 1892
- ¹³ Heusenger Virch Arch, Band cxxix
- ¹⁴ Bartelt Ueber Pulsionsdivertikel des Oesophagus Inaug Dissert, Erlangen, 1898
- ¹⁵ Klose and Paul Cited by Zenker and Rosenthal
- ¹⁶ Wheeler Dublin Journ Med and Surg, vol lxxxvi
- ¹⁷ Hackermann Beitrage zur lehre von der Entsehung der Divertikel des Oesophagus Gottingen, 1891
- ¹⁸ Freiberg Cited by Zenker
- ¹⁹ Schlesinger Wien klin Woch, April 30, 1903
- ²⁰ Nicoladoni Wien med Woch, 1877, Nr 25
- ²¹ Braun Deut Zeit fur Chir, Band lvi
- ²² Richardson ANNALS OF SURGERY, vol xxxvi
- ²³ Cassan Cited by Rosenthal
- ²⁴ Bauernfeind Inaug Dissert, Munchen, 1893
- ²⁵ Rokitsansky Lehrb d Path Anat, 1861
- ²⁶ Neukirch Deut Arch fur klin Med, Band xxxvi
- ²⁷ Jung Am Journ Med Sci, 1900, vol cxix
- ²⁸ Rumpel Cited by Jung
- ²⁹ Dendy London Lancet, 1848
- ³⁰ Beikhaus Mittheil aus den Grenzgb d Med und Chir, Band 1 1896
Berlin klin Woch, 1889
- ³¹ Bruns Cited by Veiel Beit zur klin Chir, Band xxvii
- ³² Schede Deut med Woch, 1896
- ³³ Waldenberg Berlin klin Woch, 1870
- ³⁴ Shonborn Arch fur klin Chir, Band xlii
- ³⁵ Whitehead London Lancet, 1891
- ³⁶ Koenig Deut Chir Lief, 35 Berlin klin Woch, 1894
- ³⁷ Chavasse Trans Path Soc, London, 1891
- ³⁸ Kluge Cited by Girard from Gimther's Lehre von den blutigen operationen Leipzig, 1864
- ³⁹ Bergmann Arch fur klin Chir, Band xliii, 1892
- ⁴⁰ Veiel Beit zur klin Chir Band xxvii, 1900
- ⁴¹ Hamburger Cited by Veiel
- ⁴² Berger Cited by Girard
- ⁴³ Kocher Correspbl fur Schweizer-Aertze, 1892
- ⁴⁴ Girard Cong Français 1896

ON BRONCHOSCOPY ¹

WITH REPORT OF A CASE IN WHICH A FOREIGN BODY WAS REMOVED FROM
THE RIGHT LOWER LOBE OF A LUNG THROUGH A BRONCHOSCOPE

BY ARNOLD SCHWYZER, M D ,
OF ST PAUL, MINNESOTA

THE direct examination of the larynx and trachea are rather rarely used and recent methods Bronchoscopy is the most recent addition to this kind of direct inspection, and it appears to be very little known as yet For information and instruction in using the instruments, I am indebted to the courtesy of Dr Wild, of Zurich, Switzerland, who was formerly an assistant of Professor Killian These methods are probably generally considered as belonging to the practice of specialists I do not, however, think that, for instance, inferior bronchoscopy ought to be necessarily considered as such Bronchoscopy is an outgrowth from œsophagoscopy, which was first executed by Kussmaul, and of late more brought *en vogue* by Mikulicz and others Kirstein first showed direct laryngoscopy, from which originated direct tracheoscopy The farthest step was finally taken by Killian, of Freiburg in Germany, with his bronchoscopy With straight tubes of different calibers and lengths he showed that the air-passages could be explored far beyond the bifurcation of the trachea He advises the use of the little electric head-light of Kirstein with an attached reflecting mirror, through the centre of which the surgeon looks Especially where demonstration is desired, an electric light fixed to the bronchoscopic tube (Kasper's handle) is very useful This special apparatus is not absolutely necessary, since, in the case which I am about to report, I had to make the greater part of the examination with a common search-light and a common head-mirror While it was not as convenient, the light was

¹ Read before the Minnesota Academy of Medicine, December 2, 1903
194

good and sufficient. The bronchoscopic tubes are connected with a solid handle, with which we can use quite a little force in directing the bronchoscope into the desired direction. Some guide tubes, in case we want to change the tube for a longer or shorter one of the same caliber, are added. Sponge-holders, a fine suction tube, some hooks, and several kinds of forceps constitute the armamentarium. The instruments are as well adapted for œsophagoscopy. The examination can be done either directly through the mouth and larynx (the tubes being up to fifty centimetres long) or through a tracheotomy wound (inferior bronchoscopy). The head has to be thrown far backward, so as to allow of introduction parallel to the axis of the body.

The history of the case, which was kindly referred to me by Dr. William Richeson, of St. Paul, is in brief as follows. Five weeks ago a woman, forty-eight years of age, during a coughing spell, while eating soup, felt a bit of bone get into the windpipe. There has been coughing ever since and expectoration. The temperature, which had been taken the three days previous to my first visit (October 22, 1903), was slightly subfebrile, reaching 100.2° F. As I was going out of town for three days, I advised for the start inhalations with Tinct. benzoin comp., 500, creosote and turpentine ââ 250. These inhalations, as recommended a few years ago in the Johns Hopkins Hospital bulletins, I use prophylactically and therapeutically in all kinds of surgical proceedings in the air-passages, and they have given me very great satisfaction.

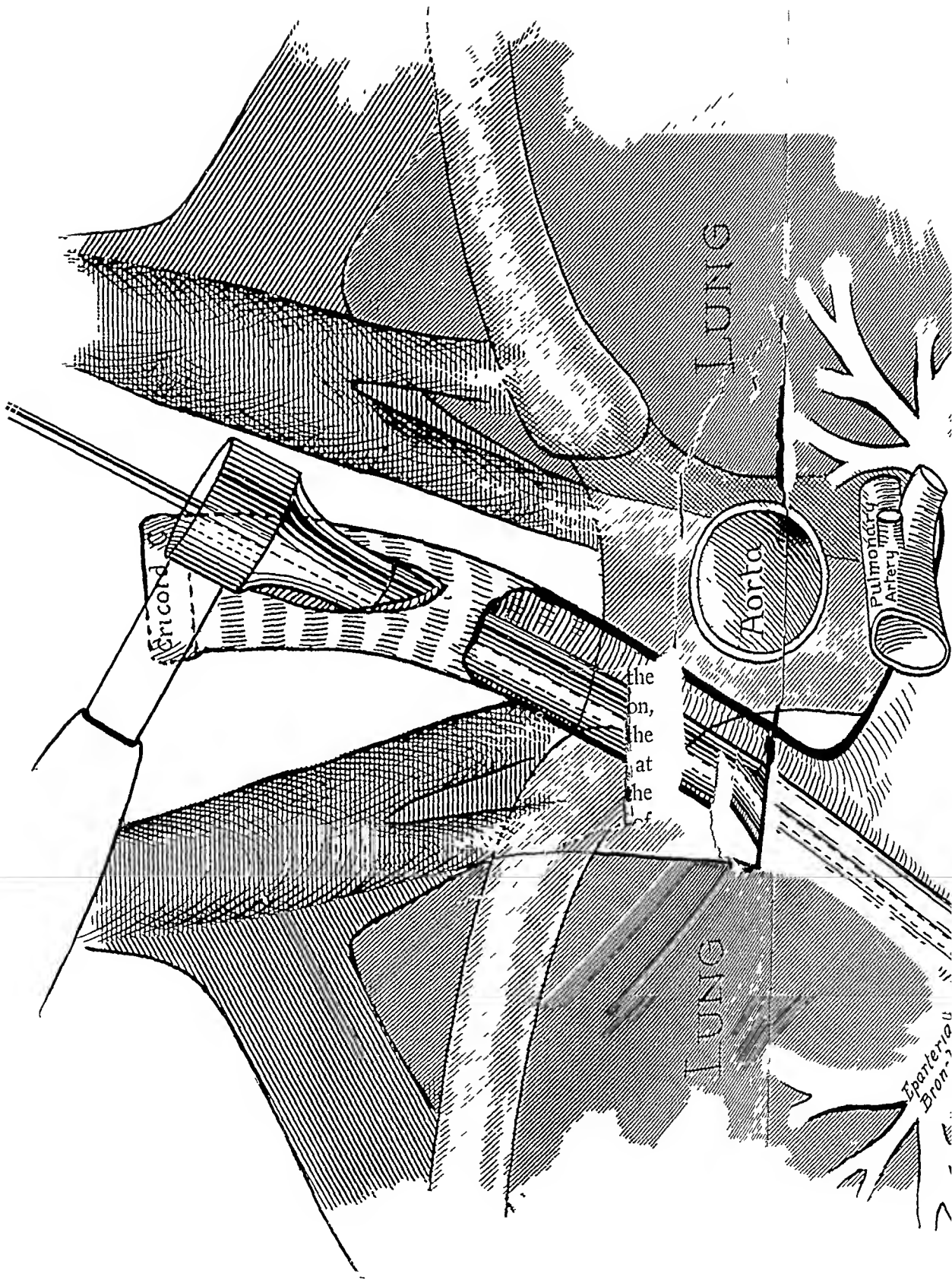
On October 26 I ordered the patient to the hospital for surgical measures for the following reasons. First. There had been some fever, now $99\frac{1}{5}^{\circ}$ F. Second. Severe coughing spells were frequent. Third. Such a case is always to be considered as a grave one on account of the secondary complications.

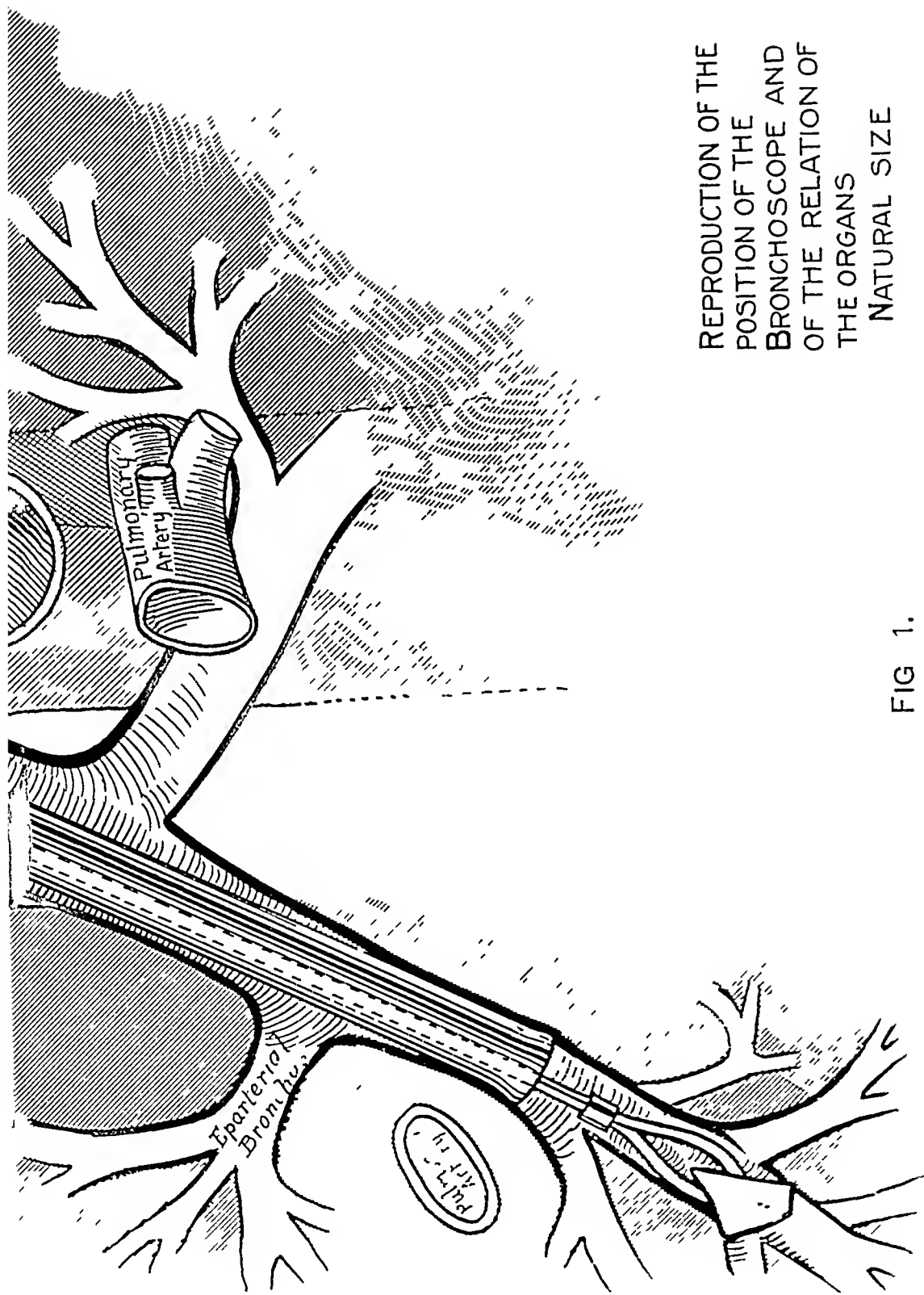
On the day of admission, an attempt was made to make a bronchoscopic examination through mouth and larynx after the application of 20 per cent cocaine in 1 to 10,000 adrenalin. On two trials to insert the tube through the larynx alarming choking spells occurred which continued for a little while even after the removal of the tube. A large goitre which she had was judged to

be partly the cause of the difficulty. The goitre presented two large lateral lobes of medium consistency, which joined over the trachea. It is just such lateral lobes which are prone to produce tracheostenosis, by side pressure on the tracheal cartilage rings, which are open behind.

A strumectomy was decided upon as a preliminary operation. This was done on October 27. A horizontal incision was made and the median portions of the two lobes were removed. There were numerous ligatures needed, but the loss of blood was very slight. Finally, the trachea was laid bare for a distance of about four centimetres. The wound was closed to a small central opening, through which an iodoform gauze strip was introduced and laid over the trachea, so as to have it handy for further measures. The wound healed very nicely up to the drainage opening. The drainage was removed after four days, and the patient was allowed to leave the hospital on November 2, six days after the operation. It was judged better to postpone the opening of the trachea until November 10 (two weeks after the strumectomy).

November 10, in the presence of Drs. G. Schwyzer, E. F. Geer, A. R. Hall, and Moynihan, the granulating wound was somewhat enlarged in the old scar line, and some granulation tissue was removed until the trachea was felt plainly under the finger and probe. The trachea was then opened by an incision, the lower end of which was about three centimetres above the manubrium sterni. This opening of the trachea was made at least two centimetres long, so as to allow the insertion of the bronchoscope without difficulty and without marked kinking of the trachea. All this was done without even local anaesthesia, but as severe coughing started when the trachea was cut into, we at once anaesthetized it with the above-mentioned cocaine adrenalin solution, the utmost care being exercised to prevent cocaine poisoning. There was not more than a small quantity at hand, and only a part of it was used. There were no signs of any general effect at any time. I judged the adrenalin would be useful, first, since by the extreme contraction of the blood-vessels caused by it the mucosa would be less voluminous, second, the hæmorrhage which would come from the injury of pushing the bronchoscopic tube up and down in the different parts of the lungs would be much reduced, and therefore much sponging would be saved and also much coughing, third, since the combination of the





REPRODUCTION OF THE
POSITION OF THE
BRONCHOSCOPE AND
OF THE RELATION OF
THE ORGANS
NATURAL SIZE

FIG 1.

adrenalin would prolong the action of the cocaine and cause it to be less rapidly absorbed. This would reduce the toxic effect, which is an important factor when the whole tracheo-bronchial system has to be explored. It may be mentioned that we did not use cocaine away down in the bronchi except when a coughing spell began to hinder the manipulations.

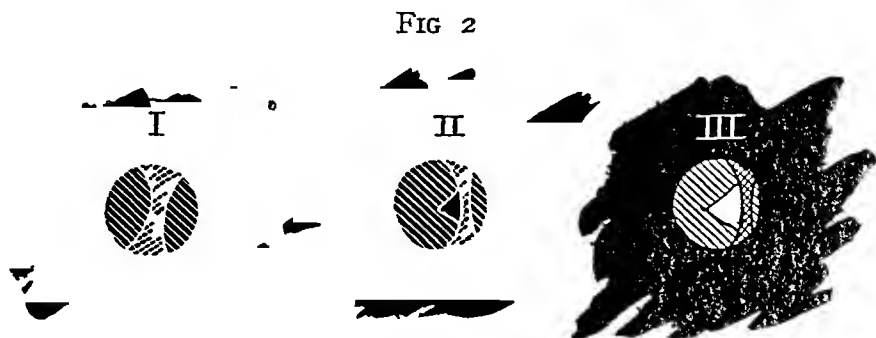
The patient was removed into a dark room and was examined in a horizontal position, the head thrown far back by a round pillow under the shoulders. The exploration of the bronchi was done only with the help of the mentioned local anæsthetic, and it was very fortunate that a general narcosis was not necessary, because the whole performance took from 9.40 to 11.55 A.M. (A part of this time was lost in often allowing the patient to rest, though usually with the tube in the bronchus.) The tube employed measured fifteen centimetres up to the thicker region of the handle. Its lumen had the caliber of a bougie No. 24. The tube was inserted down into the trachea and the bifurcation was made visible. The two principal bronchi were seen and found free. I entered the right bronchus, but could not see things plainly. Then I went back into the left bronchus. At its entrance the mucosa was somewhat hæmorrhagic, apparently slightly injured by the tube. I found the left bronchus in all its length free, and showing besides a pale color some anthracotic discoloration in small areas. The secondary bronchi were plainly seen as dividing off, but no trace of a foreign body or any suspicious change in the appearance of the bronchi could be detected.

There was much lively and even violent pulsation going on around the bronchi. This everlasting motion and activity in the chest was very impressive and made us use the utmost care in handling the instruments. The arch of the aorta rides on the left bronchus, and the pulmonary arteries are in even closer proximity to the bronchi. These large vessels, practically at their origin from the pumping heart, explain this fact sufficiently. The motion is most pronounced on the left bronchus and was no longer noticed when we had entered far down in the right bronchial tree. The more we reach the periphery with our bronchoscope the more, however, comes respiratory motion into play. The breathing was not giving any difficulty. From my drawing (Fig. 1) in which I gave as nearly as possible the natural size of the bronchi one can see that there was room for breathing on

the sides of the bronchoscope. There was, of course, lively breathing going on through the tube. Killian has shown that, when the one bronchus is entirely put out of function on account of the tube, the respiration does not become dyspnoëic. The exchange of air goes on sufficiently through the bronchoscope and the one lung under exploration.

I had satisfied myself that the foreign body (if there really was one in the lungs) was not in the left bronchi of first and (most probably) second order. By this time I had exchanged the special electric-light apparatus (the Casper handle with its light and the little Kirstein head-light) for a common laryngoscopic head-mirror with a strong electric search-light at some distance in front of me. This had become necessary on account of some trouble with the battery. The light was now brighter, but the search through the long tube was exasperating at times on account of slime and blood and coughing spells. I then began the thorough search of the right lung. The main bronchus was free but reddened, and contained much mucopurulent secretion. This change was already an important guide. The bronchus was followed to the origin of the secondary bronchi. After much searching and sponging and following the right bronchus to its end as far as the tube would reach, I thought I saw in the depth a small whitish spot. After repeated trials, I recognized it as a foreign body, and thought it to be the sharp point of a *bone*. The tube had been entered six inches (fifteen centimetres) from the tracheal opening downward. The tracheal opening was three centimetres above the incisura sterni. When the tube was allowed to lie as it would naturally, merely two bronchial openings were seen (Fig 2, I). When it was tilted with its lower end to the right in a moderate way, Fig II was seen. In the picture it may appear that the tube was now more to the left than in Fig I. It must, however, be taken into consideration that the bronchi are not solidly fixed in their course and position. In reality, the lower end of the bronchoscope was more to the right, as I had inserted the tube somewhat deeper, and felt it enter more towards the left one of these two bronchial branches, which had a straighter course downward. Then, when I had caught part of this bifurcation with the lower end of the bronchoscope, I pressed to the right so as to see straighter down into this lower bronchial branch. Now, the little triangular white body could be seen at some distance in this lower branch. When

a maximum of force was used in pressing the lower end of the bronchoscope to the right, this white triangle became as large as Fig III shows



The bronchoscopic images

I may add here, that it is surprising how one can move the exploring tube into the different bronchi. They give way to pressure, and take a straight course over the inserted instrument because they are in the loose, soft lung tissue, which is ready to yield. When we reach a division of a bronchus, tilting of the bronchoscope will allow us the entrance into the desired side, and as soon as we have entered the channel, the tube may be pushed forward, if it is done under constant control of the eye. The drawing shows how even the trachea in our case had to be moved far to the right. On one occasion I managed to introduce a small hook beyond the bone. When I, however, pulled at it, it seemed caught, and the mucosa appeared to lay itself in folds in front of the bone, which pushed it forward from behind. I did not dare to pull too hard, because I was afraid of forcing the sharp-edged bone into a more firmly fixed crosswise position, and when I could not free it with a reasonable amount of traction, I was glad when I had the little hook free again. It was not until some time after I had seen the white body that I finally succeeded in grasping it safely with a forceps. The bone was too large to be brought through the small bronchoscope, therefore I withdrew the tube together with the forceps, and fortunately the bone in its grasp. A small strip of mucosa came along also, however, there was no marked bleeding.

The bronchoscope had not reached the immediate neighborhood of the bone. The latter was about three centimetres beyond the tube. This was part of the difficulty. The accompanying photograph (Fig 3) gives the exact position of the instrument

when inserted down to the foreign body. The bone was therefore removed from a point eighteen centimetres below the tracheal opening, or fifteen centimetres below the upper border of the manubrium sterni. The measurements were taken immediately after the extraction of the bone, and they were controlled by Drs Hall and Moynihan.

It may be mentioned that the patient, who received once during the operation a hypodermic of strychnine, stood well the tedious performance, and, though she complained now and then (when asked) of being tired, claimed even towards the end to feel "good." There were at no time severe pains, but now and then a harder coughing spell was produced, when a new area of the lungs was entered into, which had not yet been sufficiently cocaineized.

It is interesting to note how the pains of the patient, who located the trouble to the left of the heart apex region, were misleading. The patient distinctly claimed that the trouble was located on the left side. I had, however, told her and the doctors present that I considered the foreign body to be on the right side, having heard moist râles of medium size over the right lower outer anterior region, and there only. This corresponded with the location of the bone. The piece being somewhat like a sharp-edged triangular pyramid explains the fact that breathing was not abolished over this lung area. The air found some opening on the sides of the bone. I had made no note about reduction in the breathing sounds.

It may be objected that we undertook all these manoeuvres and even the goitre operation though we had no absolutely sure proof that there was a foreign body present, and that we did this notwithstanding the patient had somewhat improved after the goitre operation. There had, however, occurred a severe coughing spell the evening before the bronchoscopic search, and it is just this more or less constant coughing, if it first started after a mishap in the deglutition, which is significant, especially when combined with now and then very severe coughing spells, though an adequate reason for it does not otherwise exist. Principally on this symptom I based the positive diagnosis. The patient had been well up to the point when she got something into the "wrong pipe." It happens comparatively so often while eating soup, because small pieces of bone are often there unexpectedly, and a



FIG 3 —Photograph made eight days after removal of the foreign body showing the direction and extent of insertion of the bronchoscope and the forceps

motion of inspiration is made when eating this liquid from the spoon. The history was typical in our case. Fever had set in. The case ought to have been skiagraphed before the operation, but this had to be omitted for other reasons.

The after-history is very simple. The wound was covered with gauze. Every two hours the patient received the same inhalations as before the operation.

On the afternoon of the day of the operation the patient coughed considerably and had a bloody sputum. The temperature, however, remained below 100° F, and on the following days at the highest reached 99° F.

On the day after the operation there were no râles to be heard over any part of the lungs, except at voluntary coughing, transmitted from the trachea. On the next day (November 12) the patient claimed to feel much better than before the last operation. Very little coughing, much less than before the bone was removed. Patient felt quite strong, sat up in a chair. No air passing through the tracheal incision.

On November 13, three days after the operation, the patient left the hospital. On November 18 patient came to my office, where the adjoined photographic picture (Fig. 3) was taken. Condition very good.

Of the literature pertaining to foreign bodies impacted in the air-passages, I should like to first mention the standard work of Hoffmann, in Nothnagel's "*Specielle Pathologie und Therapie*," 1897. In this treatise Hoffmann gathers 160 cases (operated and not operated), only taking into consideration the sufficiently clearly described ones. In forty-five of the cases operative measures were used, principally tracheotomy, in single cases, however, opening of a bronchiectasis or opening of an abscess cavity. Hoffmann classifies the foreign bodies in the following way:

First. Bodies apt to be coughed out on account of their weight and smooth surfaces (pieces of money, glass pearls, etc.), ten cases, with nine cures, of which six had a tracheotomy. In three cases the favorable result was not dependent on the tracheotomy.

The second group consists of hard and irregular pointed

bodies (pins and pieces of bone), which could not be expected to be coughed out. Of these he gathered fifty-one cases, among which are thirty-eight non-surgical cases with twenty-one deaths to seventeen cures, while among the thirteen operated cases there were only three deaths.

A third separate group contains ears of grain. These give very poor chances for a spontaneous expectoration. In none of the sixteen cases was the foreign body coughed out soon after its entrance. In four cases it was expectorated after a long interval (fifty days to many years), four others of the sixteen died, and eight were cured after formation of abscesses, which perforated through the chest wall.

Another, fourth, group contains the fruit kernels. Of these were, non-surgical, twenty-four cases with eight cures and sixteen deaths. Operated, thirteen cases with seven cures and six deaths. Considering separately kernels apt to swell hygroscopically, Hoffmann finds non-surgical, seventeen cases, with five cures and twelve deaths, operated ones, eleven cases, of which only three died.

A fifth group contains all the other cases of very different kinds. Hoffmann declares that surgical procedure is for the large majority of the cases the proper one, but he condemns working with hard instruments without the control of the eye. Hofmeister ("Handbuch der practischen Chirurgie," Bergmann, Bruns, and Mikulicz) also highly recommends an active but careful surgical procedure, and especially if the case is a recent one, where other simpler methods have not yielded a result. Only in a case of a foreign body of small size, which entered far down into the bronchi, where it cannot be reached from above, may an expectant treatment be allowed.

Kredel (*Mittheilgn aus d Grenzgeb der Med und Chir*, 1903, Band xi, Heft 1) reports some interesting cases, and emphasizes careful surgical measures in cases of impaction in the bronchi, even if the foreign body cannot be seen, as in small children. A flexible wire loop gave him good service.

Kredel, the latest one of these mentioned writers, thinks it doubtful that the extraction under the guidance of the mirror

should be easier, the technique, of course, being more complicated, if simultaneously a mirror and the instrument for extraction have to be handled. He appears not to have personally used Killian's instruments. He says that, as much as the results of the bronchoscopy are praiseworthy, it will hardly become popular, because there is too much special training needed and too many special instruments, etc. Furthermore, he thinks that it is doubtful whether bronchoscopic measures are less dangerous (with or without tracheotomy) than the other procedures thus far resorted to. I must somewhat differ with Kredel in these latter points. First of all as to the special training needed. While such operative measures are not within the reach of every general practitioner, a surgeon, who can do a satisfactory cystoscopic examination in male patients or even only in women, is in my estimation entitled to handle Killian's tubes for the inferior bronchoscopy. The superior methods, that is the use of straight tubes per vias naturales into larynx and trachea, are hard ordeals for the patients in most cases. The inferior bronchoscopy is, however, not as heroic a measure as it might appear.

What concerns the second objection of Kredel, the need of special instruments, I can answer that the special apparatus for illumination may, if necessary, be dispensed with, and there remain only as really needed some straight tubes and sponge-holders. The hooks and forceps are as well needed for extraction with as without bronchoscopy.

That the whole performance is less dangerous, and more satisfactory with the bronchoscope than without, will probably be admitted by every one who has used it once. It is my aim in this report to emphasize the practical value of Killian's thought.

Bronchoscopy, where it is feasible, is certainly a splendid help. And where should it not be feasible, when the trachea is opened? Even in small children it must be possible to a good measure.

Where a foreign body is so far down in the lungs, as it was in our case, I cannot see how any other procedure could be

compared with this method. Where it is possible, bronchoscopic examination ought to precede the removal of foreign bodies from the bronchi, and the manipulations and the extraction ought to be done under the guidance of this instrument, as in such way unnecessary injuries will best be avoided. In the most difficult cases the bronchoscope will be the only means of accomplishing a successful extraction.

Three days after reading this paper, I was called by Dr Plondke, of St. Paul, to see a girl of four years and seven months who had a kernel of corn in the bronchus for five weeks. The right lung had been giving hardly any breath sounds. At my examination, there was, however, breathing on both sides, and nearly equally loud. Over both lungs there were very numerous râles, most pronounced on the left side. The breathing was characteristic. It was dyspnoëic, interrupted by much difficult coughing. The finger-nails were bluish. There was orthopnoëa, the little child did not dare to lie down for fear of more difficulty in breathing. While the inspiration was comparatively rapid, and, though somewhat difficult, freer than the expiration, the latter was much labored and very often cut short, so that it appeared to me as if closed by a ball-valve. The voice was hoarse, and together with a croupy cough pointed to a difficulty at the glottis. Temperature, 100° F. I diagnosed a foreign body, which had moved from the bronchus into the trachea and was in expiration forming a ball-valve under the glottis.

I operated as soon as the preparations would allow. The child became exceedingly dyspnoëic and later on in the operation could get no air at all, so that the trachea had to be opened rapidly. Then the picture was at once changed. The air passed much more freely in and out through the tracheal opening, as though a great part of the obstruction had been in the larynx. The larynx was probably somewhat œdematous and much congested. A coughing spell made us notice a yellowish body, which was thrown by the coughing towards the tracheal opening from below. It appeared unexpectedly several times with much mucopurulent secretion. It could, however, not be

caught. We recognized that the body would have come out if the opening had been larger. Though it was of good size, the spreading of the tracheal edges had flattened the opening somewhat. I enlarged it upward and downward, and the next coughing spell made the large, long kernel fly out. Its dimensions were fourteen millimetres by nine millimetres by five millimetres. There is no question but what this kernel had been impacted into the right main bronchus, then began to swell and soften, and then entered the trachea, where it gave a marked dyspnoea for both lungs. As long as we know that a person can breathe freely with only a part of one lung entirely unobstructed, it is not surprising that the difficulty became greater for the child, when the trachea was to a great extent obstructed through this large grain, than when one lung was entirely shut off. The difficulty was even more marked in the forced expiration, when the kernel flew up against the glottis and obstructed this narrow channel like a ball-valve. I do not think that this kernel was thrown against the glottis at every expiration, but only when the child coughed. The difficulty in the inspiration was probably due to a congestion in the glottis, besides a partial obstruction by the kernel at the bifurcation of the trachea. The face of the child appearing congested and somewhat cyanosed, we must conclude that the same congestion due to the dyspnoea was in the glottis. This explains the much freer breathing as soon as the trachea was opened, notwithstanding the kernel of corn was below the opening.

Before cutting the trachea, the difficulty in inspiration was due to two causes,—the one of which was the narrowed glottis, the other the obstructing kernel at the bifurcation of the trachea. The former must have been an important factor, because the breathing and the color of the child changed markedly as soon as the trachea was freely opened. In expiration the large tracheal wound would allow of more air passing by the kernel than the narrow and swollen glottis would.

After the foreign body was removed, the respiration became easy, the cyanosis disappeared, and the breathing

through the larynx became free even when the trachea was allowed to close. The child recovered nicely.

I have been anxious to add this case to my paper, as I find several cases in the literature where the dyspnoea was not enough allowed to command all therapeutic measures. Kredel, for instance, reports a case where a child was erroneously treated for pleurisy, and where suddenly most pronounced expiratory dyspnoea occurred. The inspirations were very short and snappy while the expirations were labored, long, and whistling. No knowledge existed of a swallowing of a foreign body, and the case remained unoperated. Besides the expiratory dyspnoea, severe acute emphysema of the lungs was observed. The child died within an hour.

Of another case I found a pretty drawing of an autopsy specimen in the "Handbuch der Chirurgie". There you can see a bean impacted in the entrance to the right bronchus. It swelled, protruded gradually more towards the trachea, until finally the other bronchial opening became interfered with. Such cases cannot be too strongly impressed on our mind, and their memory is most useful for other cases of this kind. A detailed observation of the character of the dyspnoea in each case is very important, and the more we have detailed cases of this kind the more will the diagnosis become sharply detailed, and this will be helpful for the steps to be taken in each individual case. All these experiences help to condemn the expectant treatment in doubtful cases, especially since we are better equipped to explore the air-passages.

THE MIXED TUMORS OF THE SALIVARY GLANDS.

BY FRANCIS CARTER WOOD, M D ,
OF NEW YORK,

Instructor in Clinical Pathology, College of Physicians and Surgeons, Columbia
University, Pathologist to St Luke's Hospital

(A Study from the Department of Pathology of Columbia University)

(CONTINUED FROM PAGE 97)

SUMMARY OF THE CLINICAL COURSE AND GENERAL MORPHOLOGY OF THE TUMORS

BEFORE summarizing the details of the results of the study of the cases just given, it may be well to note the relative frequency of occurrence of tumors in the salivary glands Bohme, in a collection of a large number of tumors from this region, found that they occur in the parotid ten times more frequently than in the submaxillary, while the sublingual gland is the site of tumor formation only in 1 per cent of the whole number examined Kuttner also gives the proportion as eleven to one This proportion is not to be observed in my own series, for, taking those in which the source of the tumor is definitely recorded, the parotid growths number twenty-six, while the submaxillary number thirteen, or exactly half as many That this is probably due to the fact that in preserving these tumors the rarer submaxillary growths were more often saved than the more abundant parotid growths is evident from the Pathological Records of St Luke's Hospital, where the parotid growths operated upon are five times as numerous as the submaxillary Of the fifty-nine tumors recorded in this paper only four are from the lip, four from the pharynx or palate, two from the neck, and one from the cheek Even this cheek tumor was in contact with Steno's duct, and should probably be considered as connected genetically with the parotid

If we consider the tumors from the point of view of the frequency of the mixed growths as compared to the other neoplasms of the salivary glands, we find that out of the fifty-nine cases one may possibly be considered as an adenoma and two as sarcomata, a third is a fragment of embryonic connective tissue, fat, and blood-vessels, the remainder may be considered as belonging to the mixed tumors or the so-called endotheliomata. The author has in his possession three carcinomata and one pure adenoma, while a pure myxoma, a rhabdomyoma, and a round-cell sarcoma are in the collection of the Pathological Department. Evidently the mixed tumors form a large proportion of the tumors arising in the salivary glands. Cases reported by other observers show the same proportion. Kaufmann in fifteen cases of salivary gland tumors saw one angiosarcoma, Nasse in thirty-six cases saw two carcinomata and two sarcomata, Volkmann in thirty-three cases saw one carcinoma, one myxoma which he is inclined to regard as of endothelial origin, and one fibrosarcoma. Landsteiner, who has already been quoted, saw only two purely epithelial tumors out of twenty-seven examined, the remainder being of the complex variety.

Volkmann also quotes Marchand as saying the greater proportion of the salivary tumors which the latter had seen were to be classed under the general group of endotheliomata, and that purely epithelial growths were of very great rarity. The tumors described by the French observers as adenomata or epitheliomata are usually of the complex type, and very few are either pure sarcomata or carcinomata.

Kuttner in ninety-seven submaxillary tumors which he was able to collect from the literature found sixty-four endotheliomata, six sarcomata, three doubtful cases of adenoma, five carcinomata, and nineteen cases in which the description was so imperfect that no determination of the nature of the growth could be made. It is evident, therefore, that the mixed tumors form a very large proportion of the tumors of the salivary glands. As regards the pharynx and lips, it is a matter of common experience that the mixed tumors are exceedingly

rare in these situations, and that the purely epithelial tumors are exceedingly frequent

General Morphology —The mixed tumors of the salivary glands are found, as a rule, to be encapsulated, lobular growths, with harder and softer areas, the denser portions being due, as a rule, to the presence of cartilage or firm connective tissue. They can be divided macroscopically into three great rough groups with characteristic morphology, and to a certain extent with a definite clinical course

First Very fibrous tumors with very little cellular structure and with but little mucous degeneration and no cartilage

Second Very hard tumors containing large masses of cartilage and but little connective tissue or cellular parenchyma

Third Soft, very cellular growths with transparent trabeculæ of mucous tissue surrounding areas which are opaque and yellow, which on microscopical examination will be found to be dense cellular areas, the color being occasionally, though not always, due to fatty degeneration or necrosis of the cells

The first and second forms are likely to be benign in their clinical course, while the third form is likely to recur locally or to run an exceedingly malignant course

A few of the parotid tumors examined and one from the pharynx belong to the first group, about one-fourth of the growths contain more or less cartilage and fall into the second, while the majority of the mixed tumors belong to the third. It must be remembered, however, that a great amount of variation is present in different parts of the same tumor, and while one portion may be cellular the other may be composed largely of cartilage

The cellular tumors without cartilage, of the third class, have much the same consistency as an inflamed lymph node. The cut section of one of these tumors may show either a large amount of clear hyaline cartilage with a moderate amount of yellowish cellular substance lying between the pale blue translucent nodules of the cartilage, or the whole growth may be cellular and of a pale yellow or grayish hue, or, finally, the cartilage may be scattered throughout the tumor in the form

of small nodules. Some of the tumors resemble very closely soft fibromata, especially if much mucous degeneration is present. If the surface of the more cellular growths is scraped with a knife, a milky fluid can be obtained which is due to the removal of the alveolar cells by the mechanical action of the knife.

The development of these tumors may take place before birth, in which case they are often associated with other congenital defects of the facial region (Case L). As a rule, however, the actual development of these growths becomes noticeable most frequently during the second decade of life.

Time of Occurrence—In my own series the age at the time of the operation was as follows: one tumor under one year, seven between the ages of twenty and thirty, ten between thirty and forty, ten between forty and fifty, ten between fifty and sixty, and four over sixty. If the cases are subdivided according to the decade in which the tumor appeared, the age periods are somewhat different. Four tumors appeared in the first decade, one in the second, thirteen in the third, eight in the fourth, nine in the fifth, four in the sixth, while three still remain in the seventh.

The average age in these cases is then a little higher than that found by Kaufmann and Kuttner, according to whom the majority of growths appeared in the second decade. The number of tumors from other regions of the face is too small to furnish useful statistics.

The average duration of these tumors until they cause the patient to seek surgical aid is in my series eight years and nine months, thus varying only slightly from the time given by other observers, eight years. A long clinical course is not uncommon, thus, Case VI gave a history of the presence of a tumor for twenty years, Case IV for fifty-three years. The social status of the patient may also determine a variation in the time which a tumor is allowed to remain, for among the working-classes these tumors often have a longer history than among the wealthy.

Relations of Tumors to Surrounding Structures—The

anatomical position and the relations of these tumors to the surrounding structures are often characteristic of growths of this type. They are seen in the pharynx attached to the bony structures of the hard palate, often indenting the substance of the bone, but not involving the bone substance. There is usually a thick fibrous capsule which separates the tumor from the periosteum, or the capsule of the tumor may be formed by the periosteum. They also occur on the inner surface of the cheeks, generally near the openings of Steno's duct, and in the substance of the lip, most often near the median line. They also occur in the cervical region in the upper triangle of the neck and in front of the sternocleidomastoid muscle. The most frequent situation, however, is near or in the substance of the parotid and submaxillary glands. Their relations in this case are most variable. The tumors may not be in any way connected with the gland but merely lie near it, they may be attached to the gland by a pedicle or be adherent to a small accessory gland, they may indent the surface of the gland, being separated from the acini by a fibrous-tissue capsule, or, finally, the tumors may be multiple and dot the substance of the gland itself.

Usually in large tumors the remains of the glandular tissue are stretched out over the surface of the tumor and undergo pressure atrophy, but are separated from the tumor substance by a capsule. In the pharynx, the lips, and the cheeks the tumors usually lie just below the surface of the mucous membrane, but the parotid, submaxillary, and cervical new growths are below the deep fascia. They are, however, unless of a large size, easily movable in the tissues. The larger tumors are fixed, not so much by invasion of the structures surrounding them as by the tight stretching of the fascia which they cause during their growth. In those cases in which the tumor becomes malignant, the immobility is due, of course, to the invasion of the surrounding tissues.

The skin is freely movable over the benign growths. The ear may be distorted or pressed entirely backward by a large tumor in the parotid region, especially if the growth has exten-

sions behind the angle of the jaw, and is therefore unable to expand anteriorly

Clinical Course —Considering the mixed tumors from the face and neck as a group, we may say that an average of the cases in the literature shows that some 25 per cent undergo changes which express themselves in a clinically malignant course, while about 30 per cent recur after operative removal, though some of these recurrences may be stayed by a second and more complete removal. The records of my own series are somewhat different. Out of thirty-seven cases in which notes of the patient's condition after operation have been recorded, seventeen, or 45 per cent, recurred locally. In four of the cases either internal metastases were soon apparent or the local condition was so serious that the patients either died of operative shock, as in two cases, or became inoperable from the invasion of the bone and deep tissues of the neck. Of the remaining thirteen cases one is still alive after many operations, but will probably soon succumb to the growth, which is now beyond removal. In twelve cases, then, or nearly 33 per cent, there were local recurrences which were checked by operation, so that a second removal should always be attempted if the anatomical conditions permit of a complete removal of the new growth.

The malignancy of these growths can be judged to a certain extent by their slowness of growth and their physical characters. The hard fibrous and cartilaginous tumors are apt to be benign, while the soft cellular types are likely to prove malignant. But frequently a tumor which has remained for a long time quiescent will begin a most rapid growth (Case XXXVII), and in a few months increase in size more than during its entire previous existence. This sudden and rapid growth is accompanied by the clinical and microscopical evidences of malignancy, and the tumor spreads through the surrounding tissues, involves the skin and the salivary glands, and may form metastases, changes which are illustrated by Cases XXV, XXVIII, and XXXVI. Twenty cases out of thirty-seven, or 55 per cent, were permanently cured by operation.

No sufficient explanation has been adduced for the sudden change which takes place in the benign growths and causes them to become malignant. Kaufmann regards the constant traumatic irritation of the tumor by the muscles of mastication as a possible inciting agent.

It is quite probable that the dense fibrous capsule which surrounds these tumors contributes to their prolonged benign character by preventing the tumor cells from easily spreading through the tissue, for when this capsule is removed by operation on a quiescent tumor and small portions of the tumor cells are left behind in the scar, a rapid recurrence is the rule, and the new growth may reach a bulk in a few weeks greater than that of the original tumor, which may have taken years to develop. The increased vascularity of the tissues may have something to do with this rapidity of growth, for the comparative absence of blood-vessels in the primary mixed tumors is noteworthy. This poor blood supply in the original growths and the lack of close relationship between the cells of the tumors and the vessels may also be contributive to the comparative innocence of the mixed tumors, while in the sarcomata, with their very abundant blood supply and close relationship between cells and vessels, extreme malignancy is the rule. There is still a third element which must be considered as a possible factor in the development of malignancy in these growths, and that is the abundant embryonal connective tissue which is found in many of them. In two of the writer's cases of very malignant growths, the metastasis was purely sarcomatous, there was no alveolar arrangement of the cells and none of the other elements of the original tumor were present. It seems likely that the embryonal connective tissue of the original growth underwent a change which expressed itself in the formation of a rapidly growing sarcomatous tissue, and that the other elements of the tumor took no part in the process. The cartilage of the original tumor does not, as a rule, appear in the recurrences, and the amount of elastic tissue is in general much less than in the primary growth. In those cases in which a recurrence does contain cartilage, as in Case XXVI, the removal

of the primary growth has been very incomplete, so as to leave portions of the original cartilage *in situ*

In only one of the cases examined by the writer has there been metastatic invasions of the lymph nodes. This case (IV), however, was complicated by what is probably to be classed as an epithelial tumor arising in a mixed growth of the parotid. Both the remains of the mixed tumor structure and the epithelial alveoli are to be found side by side in the same section. None of the other cases of the mixed type of tumor furnished metastases involving the regional lymph nodes. Tanaka, however, considers the invasion of the regional nodes as a very frequent occurrence with the endothelial tumors, but his cases are to be viewed with considerable doubt, as none of them were from the salivary glands, and the histories and the pathological reports would incline one to regard the cases which he describes as sarcomata, especially those arising in the skin. The case of Griffin and Trombetta may be an exception to the rule of the non-invasion of the lymph nodes. The tumor was cartilaginous and of sixteen years' duration. At the close of that time it began to grow rapidly, and on the death of the patient was found to involve the lung, the pleura, the cervical, and the bronchial lymph nodes. In the tumor masses in the pleura and the lung some cartilage was detected, but none in the lymph nodes. The tumor had invaded the bone marrow and the vessels of the neck, and sent long strands down along the channels of the neck, so that it is possible that the metastases were by direct extension from the primary growth. The authors class it as a chondrocarcinoma of the submaxillary gland, so that it may fall under the same class as Case IV, the drawing appended to the paper showing a growth of carcinomatous type.

The metastases of the mixed tumors are of two varieties, local and remote. In the first form the recurrence is usually of the same type as the original tumor, that is, the general morphology of the original growth is retained and the recurrence may contain cartilage, mucus, and hyaline tissues. When the recurrences extend over a long period the tumor may gradually lose its characteristic morphology and resemble a sarcoma.

very closely (Case XXV) This change should be carefully distinguished from that in which the tumor stroma undergoes a sarcomatous change with the production of a typical sarcoma with rapidly growing and wide-spread metastases In the secondary growths of this type the stroma retains no trace of the embryonic structures, no cartilage or hyaline tissue is present, and the tumor cells do not show their original alveolar arrangement Cases XLI and XLII are examples of such changes In a case reported by Barozzi and Lesné, in which a recurrent tumor occupied the entire left side of the face and neck, the cervical and tracheal lymph nodes were invaded by the new growth The original tumor appears to have been not a cylindroma, as it is designated by the writers, but an epithelioma with mucous degeneration of the connective-tissue stroma In fact, the term cylindroma as used by the French writers has not the same significance as when used by Sattler and other German writers, but in general may be considered as designating an epithelial tumor with degeneration of the stroma

Occasionally the growth invades the wall of one of the large veins of the neck, and emboli are carried in this way throughout the body, as occurred in Case XLI of my series, but this is rare, and the growth, as a rule, remains fairly well localized, local recurrences being not infrequent unless the removal of the original growth has been very thorough, a condition often difficult of realization in the parotid growths owing to the close contact of many of the growths with the facial nerve Case XXV is an excellent example of repeated recurrences extending over a long period of time, while Case X is an example of a prompt recurrence with a final radical removal of the growth Cases XXVII and XXXVI are examples of frequent recurrences with the final death of the patient

Billroth reports a case in which, during the course of twenty-three years, nine operations were performed to remove local recurrences

The cases of primary endotheliomata of the cervical lymph nodes which exist in the literature (Zahn, Hoffmann, and Volk-

mann) ran an exceedingly malignant course, while the single case which the writer has had opportunity to observe was quite benign and did not recur after removal (Case XIX)

RÉSUMÉ OF THE MORPHOLOGY OF THE TUMORS

The details of the microscopic description of the mixed tumors are best subdivided into two groups,—one embodying the structure of the stroma, the other, the structure of the parenchyma

The connective tissue of the tumors is very variable in structure and amount. In the denser forms, especially in the tumors from the pharynx and in some of the parotid tumors, the connective tissue is arranged in very firm, dense bands traversing the growth, and also surrounding it, in the form of a firm fibrous capsule. The bands traversing the substance of the tumor divide it into a series of trabeculæ in which the cellular structures lie. These bands, as well as the capsule, stain intensely with the Van Gieson stain, and also take a very clear and sharp stain with the Mallory phosphotungstic acid hæmatoxylin, especially if, as Ribbert recommends, the material has been fixed in Zenker's fluid. There is only occasionally evidence of a basement membrane of connective tissue about the alveoli of the parenchyma cells such as exists in the normal parotid or submaxillary. The finer fibrillæ cannot be demonstrated between the cells of the alveoli nor between the cells of the solid strands of the so-called endothelial cells, even when the tissues are stained deeply with the phosphotungstic mixture or Van Gieson's stain.

The absence of connective-tissue fibrillæ between the cells of a tumor is usually regarded as indicating the epithelial origin of the tumor cells, since they are usually present between the cells in sarcomata. Some writers, notably Barth, claim to have been able to demonstrate the presence of fine fibrillæ of connective tissue between the cells of the so-called endothelial masses by means of special stains. Barth recommends Rosin's stain, which is a modified Ehrlich-Biondi tissue stain.

The staining solution is made by taking four centigrammes of the dry Ehrlich-Biondi mixture, dissolving it in 100 cubic centimetres of water, and adding to the solution seven cubic centimetres of a half per cent aqueous solution of acid fuchsin. Paraffin sections remain in this for five minutes and are then washed for two minutes in water, differentiated for ten seconds in 1 to 2000 acetic acid, dehydrated in alcohol, cleared in xylol, and mounted in dammar. The nuclei are green, the connective tissues are red.

Barth's drawings are excellent, but not absolutely conclusive, and it seems possible that he has stained some of the spindle-shaped connective-tissue cells which often lie between the flat endothelial cells, and that true fibrillæ are not demonstrated. The writer has tried this method on a number of tumors of different types, and has not been able to demonstrate this condition, nor has it been possible to do so with the phosphotungstic acid method, though the fibrillæ can be easily shown with this stain between the cells of many of the sarcomata which have been used as a control for the method.

In the softer tumors the connective tissue is correspondingly looser in texture, it is often oedematous, and very frequently is replaced by myxomatous tissue. The myxomatous changes are frequently seen, but do not seem always to be due to a degenerative process, as was considered probable by Volkmann, but rather to an actual presence in the tumor of embryonic tissue of the myxomatous type. The evidences for this assumption lie in the nature of the tissue, which does not resemble the ordinary myxomatous degeneration in connective tissue, but is more like the tissue of the embryo with its long branching cells. The quite constant association of the myxomatous tissue with cartilage is another reason for assuming its origin to be embryonic, for, as will be seen later, there are many reasons for supposing that the cartilage is derived from the Meckel's or Reichert's cartilage of the developing embryo.

Embryonic connective tissue without myxomatous structure is frequently found in these tumors. It consists of a loose fibrous tissue stroma with spindle cells scattered through it in small numbers. The spindle cells form a portion of the fibrous net-work of the connective tissue by giving off from their

cytoplasm long fibres which, in properly stained specimens, can easily be traced for a considerable distance

The cells of the stroma have been described more or less while discussing the structure of the connective-tissue elements, so that only a review is necessary here. These cells vary in number and morphology in the different tumors, depending largely upon the condition of maturity of the connective tissues present. The stroma of the dense growths contain but few cells, and these are of the familiar connective-tissue type, that is, of long spindle-shaped cells with small, evenly staining nuclei without definite chromatin net-work, and rarely showing mitotic figures. The tumors in which connective tissue of a more embryonic type is present, and the tumors of the previous group in which portions of the stroma have undergone a sarcomatous change, show cells with large nuclei and well-marked chromatin net-work. The cell body is more prominent and more sharply outlined and mitotic figures are occasionally seen. In the myxomatous and cartilaginous portions the cells are either the branching cells regularly seen in myxomatous tissue or they are the encapsulated cells of hyaline cartilage with their double nuclei. In the tumors examined by the writer no evidences of proliferation were found in either the cells of the myxomatous tissue or in those of the cartilage, though such appearances in the cartilage of these tumors have been noted by von Ohlen.

The large flat cells of the tumor parenchyma are also found scattered through the myxomatous portions of the new growth and about the periphery of the cartilage, which fact has given rise to speculations concerning the origin of the cartilage from the flat so-called endothelial cells, or of the flat cells from the cartilage. These flat cells may be few in number and diffusely scattered throughout the stroma, or they may be collected into strands spreading out diffusely through the myxomatous or fibrous tissue and also entering into close relationship with the cartilaginous areas. Some of these cells in the myxomatous portions may be observed to be closely connected with the stroma by giving off the fibrillæ into its sub-

stance, others retain the oval or polyhedral form of the flat epithelial cells lining the alveoli

Giant cells are not uncommon, especially on the cellular borders of the myxomatous areas into which they often project. The mechanical conditions here which permit the free growth of the cells into the soft myxomatous areas may possibly account for the condition, especially as similar pictures have been seen in pleural growths where the same freedom of growth is possible.

Cartilage is found in about one-fourth of the mixed tumors of the salivary glands and of the facial region which the writer has been able to examine, other observers have found it in half the tumors examined. Osteoid tissue is fairly frequent, while bone is rare. Bone was present in no one of the tumors examined by the writer.

The cartilage is either hyaline or fibro-elastic. As a rule, there are numerous fine elastic tissue fibrillæ scattered through even the more typical hyaline cartilage in the form of a fine mesh-work easily demonstrable by Weigert's method for elastic fibres.

The cells of the cartilage are usually similar to those of hyaline cartilage under normal conditions, they may be encapsulated or free in the homogeneous stroma. Occasionally, however, there are variations in the arrangement and the number of the cartilage cells and tumor cells which render it easy to distinguish from the normal tissue. The most frequent anomaly is the presence of a large number of cells without the capsule which usually surrounds them. A number of cells may collect in small masses in the substance of the cartilage and calcification may take place, the salt deposited being most frequently the sulphate of calcium. Finally, the substance of the cartilage may soften and produce small cysts containing a clear brownish fluid. The cartilage may form a greater part of the tumor, or it may be very scanty in amount and merely scattered through the tumor in small islets. In all cases it is in very intimate connection with the connective-tissue stroma and cells, and also with the so-called endothelial cells of the tumor.

The *elastic tissue* content of these tumors is not mentioned in detail in any of the monographs on the subject. Indeed, the literature on elastic tissue in tumors is still meagre and contradictory in its statements. Melnikow-Raswedenkow found no newly formed elastic fibres in tumors, all those present were derived from the organs in which the growths occurred. He examined connective-tissue tumors, epithelial tumors, teratoid tumors and cysts, and concludes that there is but little elastic tissue in any one of these growths, and also that the elastic tissue of the organs invaded is only mechanically influenced by the tumor cells in their growth.

Williams, on the other hand, found that a few fine fibres are occasionally seen in the newly formed stroma of the carcinomata, but only in tumors in which the stroma was especially abundant.

Alice Hamilton describes a fibrosarcoma of the brain in which numerous elastic fibres could be demonstrated which she considered as newly formed, inasmuch as they were not confined to the region of the blood-vessels, which is the only site of elastic fibres in the brain substance. Huguenin, in an adenoma (?) of the testicle containing cartilage, glands, and epithelial masses, says that the cartilage in his preparations contained no elastic fibres, but admits that the stain was not entirely satisfactory, owing to the method of preserving the material. In some of my own specimens of mixed tumors of the testicle elastic tissue was very abundant throughout. Gluski found little or no elastic tissue in a mixed growth from the oesophagus. K. Landsteiner is the only observer who mentions the abundance of the elastic fibres in the salivary tumors.

The elastic tissue in the mixed tumors is very much more abundant than in the sarcomata or carcinomata. In the latter it is largely confined to the pre-existent stroma, and there is only a moderate new production, and this in the region of the vascular system. In the mixed tumors, however, the stroma of the growth is penetrated by a fine mesh-work of fine and coarse fibres of elastic tissue. These are specially abundant in the dense fibrous tissue of the capsule and the trabeculæ of the

more fibrous growths. In the soft embryonic fibrous tissue of the more cellular tumors the elastic tissue is in the form of very fine branching fibrillæ having no connection with the blood-vessels. In the cartilaginous parts the elastic tissue penetrates all portions as a fine net-work, not so dense, however, as in true fibro-elastic cartilage. The elastic fibres usually encircle the alveoli in considerable numbers, but do not penetrate between the cells lining the alveoli. When the stroma cells diffuse out through the connective tissue, or even when they remain in solid strands, the finer elastic fibres often penetrate between the cells. The fibre net-work may surround a single cell or it may surround a group of several cells.

Blood-vessels are infrequent in these tumors, and when present seem to bear little or no relation to the cells of the parenchyma. They are usually seen in the connective-tissue trabeculæ of the more fibrous growths and present no peculiarities.

Small areas of fat tissue are to be found in a number of the mixed tumors inside the capsule of the growth and lying in the connective-tissue stroma. They are quite independent of the fat of the surrounding connective tissue, the gland with which the tumor is in relation, and are probably derived from the embryonic connective tissue which forms the stroma of the growth.

The same is probably true of small lymphoid areas which are not uncommon in the mixed tumors. Their derivation is in all probability the lymphoid tissue of the buccal and pharyngeal mucosa, and is especially well marked in the cysts and clefts from the branchial pouches which have persisted until adult life, and still retain a well-developed envelop of lymphoid tissue about the epithelium lining the cavity of the cyst or sinus.

The Cells of the Parenchyma —The cells of the parenchyma of the mixed tumors are arranged either in alveoli or in solid strands which are often connected with alveoli at some portion of their extent. When arranged in alveoli they are large and flat resembling epithelial cells in their general grouping, but differing from ordinary epithelium in having

an oval homogeneous nucleus without a well-marked nuclear net-work, the entire nucleus staining diffusely. The cells under ordinary conditions do not show intercellular bridges nor spines, such as are frequently seen in epithelial cells. These cells may be high and cylindrical, they may be cuboidal or polygonal, and, finally, if the lumen of the alveolus be filled with accumulated material, they may be flattened out into low cells resembling the endothelium lining the blood-vessels. In a number of the tumors examined, instead of alveoli being present the parenchymal cells are in long strands, as above indicated, extending through the tissues closely attached to the connective tissue of the tumor and often containing long spindle-shaped cells of an evidently connective-tissue nature. The cells of the strands may also give off long fibrillar prolongations to the connective tissue. This can be best seen in the myxomatous portions of the tumor, for there the fibrillæ can be more easily traced.

As was stated under the heading of the fibrous stroma, no connective tissue can be made out between the parenchyma cells, either when they are in alveoli or in strands. When sections are stained either with Van Gieson or with Mallory's connective-tissue stain, fibrillæ can occasionally be demonstrated between the cells, but this appearance is due to the spindle cells lying between the others, and is not of constant occurrence. A basement membrane is not usually present about the alveoli, but the elastic fibres are occasionally very abundant around them.

In a few tumors the cells lining the original alveoli are crowded together by connective-tissue growth and degeneration, so that the lumen is lost and the whole structure distorted in much the same way as in an intracanalicular fibroma of the breast. Case LIX is an excellent example of this form of distortion. (Plate VIII, Fig. 2.)

An important point of difference between the cells lining the alveoli of this form of tumor and the cells of an epithelial new growth is that the normal endothelium lining the lymph spaces can generally be seen under a layer of epithelial cells,

while it cannot be so seen in the alveoli of the mixed tumor cells. That this is not always true can be seen in Case XX, where the so-called endothelial cells of the tumor can be made out advancing over the normal endothelium lining a lymph space, just as the cells from a carcinoma may be seen to advance over the endothelial cells of the lining of the lymph channels of a lymph node (Plate II, Fig 2)

As previously stated, Volkmann claims that the so-called endothelial cells lining the alveoli do not shrink away from the connective tissue with which they are in contact, as is the case in carcinomata, even when the tissue is considerably shrunk by fixing agents. Borst and others have shown, however, that this distinction cannot be strictly held, for in some of the endothelial tumors the cells do shrink away from the connective-tissue walls of the alveoli, and in carcinomata it is easy to find areas where the epithelial cells remain in contact, even though there is considerable shrinkage during the hardening process. It is true, however, that the separation occurs more frequently in the carcinomata and is rare in the mixed tumors.

Epithelial cells with well-marked spines are more or less abundant in the parenchyma of eight cases in my series of fifty-nine. They are arranged very frequently in pearls, the centre of the pearl staining strongly with eosin, as in the pearls from the ordinary epitheliomata of the skin. When stained with Kromayer's modification of Weigert's fibrin method, well-marked keratohyaline granules can be made out in some of the cells at the periphery of the pearls, and also a moderately well-marked fibrillation which passes from one cell to the other (Plate V, Fig 2). The intercellular bridges are well marked in many of the pearls and in some of the alveoli in which no pearl formation has taken place.

In six of the other tumors examined, which did not contain pearls, cell alveoli were found which bore a very close resemblance to the ducts of an atrophic salivary gland. These alveoli were lined with a single layer of cuboidal cells and possessed a well-marked basement membrane (Plate I, Fig 2).

Three of the smaller tumors were embedded in paraffin

and sectioned in a complete series. In no one of them were well-marked epithelial spine cells demonstrated. A large number of sections from the other tumors were examined, but no spine cells were found, so the presence of epithelial spine cells cannot be regarded as a constant or even a frequent occurrence, as Hinsberg is inclined to believe.

Connected with the pearls, branching strands of cells are often seen, which lack the characteristic morphology of epithelial cells and resemble the strands considered by Volkmann as endothelial in nature.

DISCUSSION OF RESULTS

If we look over the case histories of a series of tumors of the type which we have described, in order to obtain some clue to the conditions which surround their origin, we are struck, in the first place, with the fact that all these new growths arise in regions of the body which are characterized by two conditions,—one, the presence of complex organs either of epithelial or mesoblastic origin, and, secondly, from an embryological point of view, by an extremely complicated course of development.

Both of these conditions obtain in the facial region and in the region of the development of the kidney, ovary, and testicle, to which areas these complex tumors are practically confined, if we except the site of the postanal gut, where complex forms also occur under precisely the same conditions.

If we consider these tumors as a whole, we must notice that they contain elements which are derived from the mesoblast at a comparatively early stage of differentiation. Evidently, cells of mesoblastic origin must have been left in these situations at a period when they contained all these tissue possibilities and before a final differentiation took place, for the change into a definitive form of cell precludes the possibility of further differentiation, as, for example, the final changes of undifferentiated embryonic mesoblast into the highly specialized cell forms, such as muscle or cartilage, preclude further changes except of a regressive type.

It is interesting to observe more closely the association of these tumors and malformations which result from imperfect adjustment of the tissues which go to form the facial region. These malformations are the dermoids of the orbit and the eye, the cysts and fistulæ which arise from the imperfect closure of the thyroglossal duct or the branchial clefts, the imperfections from lack of union of the lateral processes forming the mouth and cheeks, and, finally, the malformations of the ear, with either an accessory tragus or mandibular or cervical tubercle. In Case L, a small congenital parotid tumor was present in the upper part of the parotid, while just behind it was a supernumerary spur of cartilage derived from the non-union of the spina helicis with the helix. There was present also an auricular fistula in the helix resulting from the same lack of union between the helix and the spina. (See Schwalbe and Gradenigo.) The tumor was a complicated growth, containing among other things a considerable amount of hyaline cartilage, the spur, on the other hand, contained yellow elastic cartilage, and was therefore not, in all probability, derived from the same source as that in the tumor, but the connection of the tumor of the parotid with the other congenital lesions is strongly suggestive of the simultaneous displacement of both sets of remnants.

The derivation of the cartilage which these complex tumors contain has always interested pathologists. There are two chief possibilities to be considered, one, which has long been held, is that the cartilage is derived by a process of metaplasia from the connective tissue of the tumor or from the tumor cells, the other is that the cartilage is either a remnant left in the formation of the branchial arches, or that certain cells are left from that portion of the embryo which is to finally form these arches, and that these cells are capable of developing into either an undifferentiated fibrous or mucous tissue or into the more highly differentiated form of cartilaginous tissue.

Virchow's idea was that the cartilage originated in the connective tissue, much as cartilage arises from the periosteum of bone, and this view is developed in Volkmann's paper. The

latter holds that the process is "exceedingly simple," and consists in a chemical alteration of the intercellular substance by which the fibrillæ of the connective tissue are softened and dissolved into a more or less homogeneous mass of basement substance, and thus forms either cartilage or myxomatous tissue. The flat cells of the tissues then undergo a metamorphosis in response to that which has taken place in the connective tissue, and become either encapsulated cartilage cells or emit fibrillæ and become the branching cells of the myxomatous tissues. All transitions can be observed between the cells and the connective tissue, but the most frequent process is the transformation into myxomatous tissue first, and then an alteration of the cells and the stroma into cartilage. Volkmann and von Ohlen find that the cartilaginous portions are often the site of very active proliferation, and that they form long strands of cells similar to those seen in other parts of the growth. Against all these views are the facts that the cartilaginous tumors are of extremely slow growth clinically, that mitotic figures have not been found in the cells of the cartilage by the writer and many other observers, that the elastic tissue is not arranged in the cartilaginous portions as it would be if the pre-existing connective tissue had merely become softened, but is in fine fibrils scattered throughout, that the cartilage is not found in the metastases, but only in local recurrences, and, finally, that these degenerative changes in connective tissue with the formation of cartilage do not take place in other tumors which contain abundant connective tissue, but only appear in a certain narrow group of tumors which are in all probability congenital in their origin.

Cohnheim, in his lectures on general pathology, said long ago that "the germs of the cartilaginous tumors of the parotid region are unused remnants of the cartilaginous portions of the branchial arches."

Klebs believes that when the organism has reached a certain physiological point of development and the cells possess a degree of specific stability, that cartilage can only be produced from embryonic remnants.

Orth also holds the same view of the origin of the cartilage, while most of the special writers on the subject support Volkmann in deriving the cartilage from the connective tissue.

In general, it may be said that the idea of the change of one tissue into a closely related form is gradually losing the general acceptance which it once possessed, and such changes are more and more being considered as due to embryonic errors of development.

Ribbert, in his latest publication, when speaking of the metaplasia of connective tissue into cartilage or myxomatous tissue, says that such changes even within these narrow limits are very infrequent in their occurrence, and that there is considerable reason to suppose that these appearances may be due to embryonal misplacements of tissues. In another section he considers it probable that most, if not all, of the pure myxomata are due to some congenital remnant of mesoblast displaced at a stage when it contained the possibilities of myxomatous development. Lubarsch states that while it is undoubted that the "epithelia" lining the serous cavities and the blood-vessels can produce connective tissue, which can best be seen in the organization of thrombi and the inflammation and foreign body irritation of the serous cavities, the question of the metaplasia of endothelial cells into cartilage cells is more than doubtful. Benecke considers that this change is possible in tumors, but the condition may be due to an embryonic misplacement of cells. Certainly the fact cannot be regarded as proven. The possibility of the metaplasia of true ento- or ectodermal cells into connective tissue has never been positively shown. Kromayer's interpretation of the pictures which he obtained in the examination of the soft nævi of the skin has never been widely accepted, and the view of Unna that the nævus cells are epithelial in origin is now generally received. It is especially difficult to prove the metaplasia of epithelium into connective tissue in the skin because the epithelial cells become flattened and drawn out into long spindle-shaped forms which often lie in close connection with the connective-tissue fibrillæ of the pre-existing stroma, so that this apparent change into con-

nective-tissue cells is to be regarded as the result of mechanical action, and true connective-tissue cells in the biological sense have not been produced. This mechanical change may also occur in the epithelial masses of the salivary mixed tumors.

The main weight of the evidence seems to be on the side of the congenital misplacement of cells which have the power to form either cartilage or myxomatous tissue. The same explanation would account most simply for the presence of fat and lymphoid tissue in these tumors. Fat tissue is not ordinarily seen in tumors as a portion of the growth itself, but usually as a part of the tissue through which the tumor may be growing. But in many of the congenital tumors,—for example, those from the kidney,—whose origin from embryonic misplacements is more definitely settled than in the case of these complex tumors of the parotid, the presence of fat tissue and striated muscle in intimate relationship is regarded as a valuable evidence of the derivation of the tumor stroma from the mesoblast at a time when the kidney rudiments were in close contact with the muscle-plates of the middle layer of the embryo.

The examination of sections of human embryos of from six to twelve weeks of age shows that such embryonic displacements may easily occur in the region of the salivary glands. In transverse sections through the head of embryos of this age, the parotid and the submaxillary may be seen as small outgrowths from the floor of the mouth, lying almost in contact with the first and second branchial arches, or rather with the cartilage which these arches contain. Very often tubules of the gland may be found to be surrounded by the cells of the perichondrium.

Inasmuch as the arches reach their development at or about the fourth week, and at that time contain the cartilaginous tissue which forms Meckel's and Reichert's cartilages, while the parotid does not appear until the sixth or eighth week, for any embryonic remnant to contain both parotid and cartilage, the tissue must have been displaced before the fourth week. It is not therefore a portion of parotid tissue which is

displaced, but a portion of the epiblast which is to line the buccal cavity, together with some of the underlying mesoblast, the latter carrying with it the whole group of mesoblastic possibilities,—cartilage, myxomatous tissue, fat, and even muscle¹ This necessarily early displacement of the tissues would make up the tumor accounts for the great variability of the mesoblastic and epiblastic structures present in the growth and the close intermingling of cartilage, myxomatous tissue, hyaline, fat, muscle, and bone, together with cells of both epithelial and connective-tissue types

This early derivation of the remnants is also a point upon which Wilms has rightly insisted as rendering superfluous the explanation which Hinsberg finds necessary to make in order to account for the presence of cornified epithelium in the midst of these complex tumors Hinsberg has to assume a metaplasia of the parotid glandular epithelium into epidermal cells, but if it be remembered that the displacement takes place before the buccal epithelium has become differentiated into parotid, and while it still retains the qualities inherent in that epithelium, that is, of forming epithelial cells for the lining of the buccal cavity, the assumption of metaplasia to account for the presence of the epidermal cells is quite unnecessary

Hinsberg's further assumption that the epithelium might possibly be derived from the rudiments of the tympanum, which at this stage lies quite close to the parotid, is rendered doubtful by the fact that epithelium has been found in the submaxillary tumors, but the distance of the submaxillary gland from the tympanum is so great at all stages of development that such a displacement of tympanic epithelium is quite out of the question

If now we turn from the elements of the stroma to the parenchyma of these tumors, the most striking feature is the presence of numerous cellular structures arranged either in solid strands or in the form of alveoli lined with flattened

¹ See report of a rhabdomyoma of the parotid by Prudden, *American Journal of the Medical Sciences*, 1883, page 438

cells Some of these cells are evidently epithelial in origin from their morphology, which is that of spine cells with well-developed intercellular bridges and keratohyaline granules or of tubules lined with cylindrical epithelium The latter forms occur, so far as the tumors examined show, but rarely in any of the new growths from the facial region, they are frequent, however, in the tumors of the testicle The other type of cells is that which has long been designated endothelial, because these cells possess a morphological aspect strikingly similar to the endothelia lining the lymph spaces

Three views are possible as to the origin of the cells One, that they are endothelial in nature and derived from the endothelium of the lymph spaces, second, that they are epithelial and derived either from a misplaced portion of the parotid or from a misplacement of the mesoblast and epiblast at a period when the cells have not as yet developed into the highly differentiated gland cells, but contain the possibilities of such development only, as is explained above in the discussion of the probable origin of the cartilage, third, that the tumors contain both endothelial and epithelial elements

We will first take up the endothelial view as presented by Volkmann and his successors

1 Is the endothelium capable of producing tumors? That this is probable is shown by the cases of tumors occurring in lymph nodes where epithelium cannot be present, and also in tumors of the bone marrow and the spleen, such as have been recently collected by Bovaird The splenic tumors are, however, more probably hyperplastic growths than true tumor formations The tumor reported by Sailer must also be regarded as a growth from the endothelium of the vein in which it was found The tumors of the dura are no doubt of an endothelial character

2 Are the parenchyma cells of the complex salivary tumors derived from the endothelium? The various facts which have been adduced to substantiate this view are

(a) The cells resemble endothelial cells from a purely morphological aspect That this is of slight value in the

determination is shown by Case VI of my own series, in which typical epithelial cells can be found in strands of cells otherwise conforming in all morphological points to endothelium. The same is true of cases reported by Hinsberg, Landsteiner, and Wilms in which spine cells have been found.

(*b*) The cells of the tumor are continuous with the cells of the peripheral lymph spaces in the capsule of the tumor, and that the endothelium of these spaces takes part in the growth of the tumor. Ribbert, Borst, and others have shown, however, that the lymph-space endothelium does not take part in the tumor growth, and that the spreading of cells of a new growth along lymph spaces, either with or without active growth of the lymph-space endothelium, is possible in carcinoma as well as in the so-called endothelial tumors. Ribbert has also called attention to the fact that the spaces which Volkmann regarded as normal lymph spaces in the fibrous tissue were not in fact lymph spaces, but tumor alveoli. The apparent new growth of endothelium in the spaces is due to the fact that the cells of the tumor grow over the endothelial cells already present and give the appearance of an hyperplasia of the pre-existing cells.

(*c*) The argument based upon the supposition that the cells of the endothelial tumors do not shrink away from the walls of the lymph spaces, and that the original endothelial cells cannot be seen under them, has been shown, by the observations of Borst, Lubarsch, and many others, to be incorrect. One of my own cases shows this shrinkage in many parts of the tumor. (Case XX, Plate II, Fig. 2.)

(*d*) Ribbert, Lubarsch, and others have shown that the fact upon which so much stress has been laid, that the solid strands of cells are in intimate connection with cells of undoubted mesoblastic origin, has but slight value in deciding that the two groups of cells are of identical origin, for such secondary unions of true epithelial and connective tissues are not infrequently observed in the epithelial tumors of the skin.

(*e*) The fact that the tumors are not closely connected with the salivary glands, and that the cells of the new growth

are not connected with those of the gland, but are separated from it by a capsule, does not prove that the cells of the tumor are not of epithelial origin, but only that they were separated from the glandular rudiments before the latter were enclosed in the capsule normally surrounding the gland. The formation of this capsule takes place about the fourth month of foetal life, while up to this time the acini of the gland are in close relationship with the periosteum of the inferior maxilla.

If we take up, on the other hand, the considerations which point to the view that the cells of these complex tumors are derived from the outer layer of the embryo, we find that they are based upon the following facts

(a) Epithelial cells with intercellular bridges and keratohyaline granules are found in a few of these tumors, which are otherwise of a typical endothelial morphology. The epithelial cells lie in masses which would under ordinary circumstances be considered as very closely related to the surrounding connective tissues.

(b) Well-formed tubular glands with a basement membrane and a lumen filled with a homogeneous secretion are found in a few of these tumors, which are otherwise typically endothelial according to Volkmann.

(c) A great proportion of these tumors contain alveoli filled with a material resembling the colloid secretion of the thyroid or the material which may be found in the alveoli of an atrophic salivary gland.

(d) There is no connective tissue between the cells, as is generally the case in tumors of a mesoblastic origin. This is seen in stained preparations and in sections which have been either shaken out or pencilled to remove the cells of the parenchyma.

(e) These tumors occur only in or near epithelial structures and in regions in which congenital inclusions in the form of dermoids and cartilaginous remnants are fairly frequent. The intimate mixture of tissues of widely different type in a single tumor is a strong presumptive evidence that the growth is of congenital nature.

It is difficult to apply a suitable name to this group of tumors, and yet it is advisable to do so, if for no other reason than to call attention to the fact that they cannot be classed as adenomata, nor as epitheliomata or carcinomata, nor yet as sarcomata. From each of these groups of tumors the complicated growths which we have studied are separated by their morphology alone. The writer prefers to return to the old name of "mixed tumors," or, perhaps better, complex tumors, though the introduction of the latter might be justly criticised as adding a new name to our already complicated nomenclature.

The problem of the exact nature of these growths cannot be definitely settled so long as we must rest our distinctions upon morphological or histogenetic differences. The experiments which Ribbert, Lubarsch, and many others have carried out on the results of the transplantation of normal glandular tissues have given us only studies upon the atrophy and partial regeneration of fragments as grafted upon other tissues and under the most unfavorable conditions for permanent growth. We cannot expect too much of the transplantation of mature, highly differentiated tissues into an unfavorable environment, nor have the results of the transplantation of embryos or fragments of embryos afforded the results for which we hoped. The change of place and environment must be made at an earlier date and in a manner somewhat less crude than has been practised heretofore. Experimental teratology has at present only given results when applied to the lower forms of animal life.

CONCLUSIONS

To sum up the results of this study in a few words:

I There is a group of extremely complicated tumors occurring in the facial region which contain elements from both epi- and mesoblast in most intimate relation to each other.

II The complicated structure of the stroma, containing as it does elements such as embryonic connective tissue, cartilage, bone, fat, and lymphoid tissue, and very rarely striated

muscle, is explained most easily by the assumption of an embryonic misplacement of mesoblast

III The structure of the parenchyma is so slightly characteristic in morphology that its epithelial nature in all cases can only be considered as probable, yet in about 24 per cent of the tumors examined the presence of epithelium is undoubted The form and relationships of the cells of the parenchyma do not furnish sufficient data to justify these cells being regarded as of endothelial origin

IV The theory of early embryonic displacement of epiblastic tissue during the process of formation of the parotid and submaxillary glands and the branchial arches may account for many of the morphological peculiarities of the cells of these tumors, especially the lack of many typical features which we associate with epithelium The same condition may be seen in the epithelial cells of the congenital moles, in which the epithelium is with difficulty distinguished from connective-tissue cells, owing to its close connection with the stroma of the tumors and its undifferentiated type

V The mixed tumors of the salivary glands run a clinical course strikingly different from the sarcomata and carcinomata in that they are slow growing and generally benign The regional lymph nodes are not invaded, and recurrences are likely to remain local in a considerable proportion of the cases

BIBLIOGRAPHY

Only those papers which are directly concerned with the salivary group of tumors are included here, and chiefly those which have appeared since 1896 Volkmann's "Monograph" contains a very complete collection of the articles before that date

- Barozzi et Lesne Cylindrome de la region sous-maxillaire Soc Anat de Paris, March 19, 1897, p 266
 Barth, T Lymphangio-Sarkome des Mundbodens Diss, Jena, 1896 Also in Beit v Ziegler
 Beadles, C T Myxomatous Tumor of Submaxillary Trans of London Path Soc, Vol xlviii, 1897, p 66
 Benecke Artikel Chondrom in Drasches Bibliothek der med Wissenschaft, 1900 Ueber freies Wachstum metast Geschwulstelemente in serosen Hohlen Arch f klin Med, Band lxxiv, p 237

- Berger *Rev de Chir*, 1897, p 361 Tumeurs mixtes du voile du palais
- Biondi Sei casi di chirurgia della glandola parotide *Clinica chirurgica*, 1899, No 1
- Billroth *Virch Archiv*, Band xvi, 1859
- Bland-Sutton Tumors, Innocent and Malignant
- Bohme *Zur Kasuistik d Speicheldrusengeschwulste* Diss, Berlin, 1892
- Borrmann Ein Blutgefassendotheliom, etc *Virch Arch*, Band cli Supplementheft, 1898, p 151 Wachsthum d Gefassgeschwulste *Virch Archiv*, Band clvii, 1899
- Borst, Max Das Verhalten der Endothelien bei der acuten und chronischen Entzündung Würzburg, 1897 Verhand der Physik-Medizin-Gesellschaft zu Würzburg
- Bosc et Jeanbrau Parotid Tumeurs Nouveau Montpellier Médical, 1899
- Bottcher *Virch Archiv*, Band xxviii, p 400
- Bottini *Chir des Halses*, 1898
- Bovaird *American Journ Med Sciences*, 1900, p 377
- Bridson *ANNALS OF SURGERY*, Vol xxx, 1899, p 219
- Brosch, A Zur Frage der Entstehung der Nierenzellen aus Endothelien *Virch Archiv*, Band cxliv, p 289
- Du Castel Cylindrome de la région parotidienne *Annales de Derm et Syph*, 1897, p 187
- Cavazzani, T Angiosarcoma *Rivista Veneta di Scienze Mediche* Tome xxvi, 1896, p 405
- Chambard *Revue de Méd*, 1880
- Chaput *Bull et Mém Soc Anat de Paris*, 1900, ii, pp 906-908
- Collet, André Des Tumeurs mixtes des glandes salivaires des levres Paris, 1895 Abstract in *Cent f Path*, 1896
- Cone, S M *Bull Johns Hopkins Hospital*, May, 1898, p 114
- Cordes, H Ein Fall von Endothel myxomatodes palati molliis *Deut med Woch*, 1900, No 35
- Curtis, B F *The Post-Graduate*, 1898, p 25
- Curtis et Phocas *Arch prov Méd*, 1899
- Degen, D Ein doppelseitiges Sarkom der Parotis Diss, Freiburg, April, 1900
- Delabarberie *Arch gén d Méd*, 1890
- Dunbar and Potel Tumeurs benigne du voile du palais (Fibroma) *Echo méd du Nord* 1900, p 588
- Dutton, T E *Liverpool Medico-Chir Journal*, 1898, xviii, p 369
- Eberth and Spude Familiare Endothelioma (In white mice) *Virch Archiv*, Band clvi, 1898
- Eisenmenger Die plexiformen Sarkome des Gaumens *Deut Zeit. f Chir*, 1894 Band xxxix, p 1
- Elsching, A Haemangioendothelioma tuberosum multiplex *Wiener med Presse* 1896, p 169 No 5 (Skin Tumor)
- Ernst Ueber diffuse multiple Angio-Lipombildung mit Endothel-Wucherungen Diss, Freiburg 1896
- Finger, J Endothel fibrosum der weichen Hirnhaut und Bemerkungen über Endothel und Endotheliome überhaupt Diss, Würzburg, 1897

- Furstenheim, W Kiemengangshautauswuchse mit knorpeligem Gerüst
Jahrb f Kinderheilk, 1895, Band xl
- Gaucher Epithel prim de la rate Thèse de Paris, 1882
- Gevaert Tumors of Palate Belgique Medicale, 31 mars, 1898 (Unimportant paper, chiefly clinical)
- Gluski Virch Archiv, 1902, p 381
- Glockner Riesenzellen u endotheliale Geschwulste Beit v Ziegler, xxvi, 1899, p 73
- Gouguenheine et Ripault Contribution a l'étude des tumeurs benignes du voile du palais Annales des Maladies de l'oreille, du larynx, 1896, xxii, pp 1-9
- Gradenigo Missbildungen der Ohrmuschel Archiv f Ohrenheilk, Band xxxiv, 1893
- Griffini and Trombetta Atti d R Accad di Turino, Tome xviii, 1883
- Gruenhagen, E G Beitrage zur Lehre von den Speicheldrüsen Tumoren, Diss, Berlin, 1898
- Hamilton Journ of Experimental Medicine, 1899
- Hammer Tumoren des Oberkiefers und angrenzender Gegenden Virch Archiv, Band cxlii, p 503
- Hansemann Path Anat et Hist des Carcinoms Deut med Woch, No 33, 1901, p 554 Ueber die Bezeichnung Endotheliom Deut med Woch, 1896, Nos 4, 14 Verh d Naturforscher Versam, Frankfurt, 1896 Bosartige Geschwulste, 1902, p 62
- Haug Arch f Ohrenheilkunde, Band xliii, p 10, 1897 (Ear cases)
- Henkel, Max Beitrage zur Histiogenese der Parotisgeschwulste Inaug Diss, Berlin, 1896
- Hess, F Beitrage zur Geschwulstlehre Inaug Diss, Bonn, 1896
- Hinsberg Beit zur Entwicklungsgeschichte u Natur d Mundspeicheldrüsen geschwulste Deut Zeit f Chir, Band li, 1899, p 281 Beit z klin Chir, 1899, Band xxiv, p 275
- Von Hippel Ziegler's Beit, 1893
- Homp, G Angiomyxsarkom d Thranendrüse Diss, Königsberg, 1896
- Huguenin Virch Archiv, 1902, p 396
- Hutchinson, J, Jr Adenochondroma of the Submaxillary Gland Trans London Path Soc, Vol xlviii, p 63
- Janssen Virch Archiv, 1895, Band cxxxix
- Jawenko Mischgeschwulste d Parotis Diss, Würzburg, 1897
- Jolly, J Étude Anatomopathologique d'un angiome sarcomateux Arch de Med, Exp, Tome vii, 1895, p 621
- Josuran, C Veränderung d Epithels in chron entzündeten Parotis Diss, Zurich, 1898
- Kaufmann Parotissarkome Arch f klin Chir, Band xxvi, p 672
- Klaatsch Ueber d jetzigen Stand der Keimblattfrage mit Rücksicht auf die Pathologie Munch med Woch, 1899, No 6, p 169
- Klein, G Endotheliale Metastasen des Carcinoms Verh d Deutsch Naturf und Aerzte, 1896, p 18
- Koch, U Ueber Parotis Tumoren Diss, Freiburg, 1897
- Kolossow Biol Cent, Band xii, 1892, p 87 Arch f Mik Anat, Band xlii, p 318

- König, F, Jr Cent f Chir, No 27, 1899, p 19 Verh Deut. Gesell f Chir.
- Kosłowski, B S Chirurgie, 1898, p 447 (Russian) Abstract in Centralbl f Chir, 1899, No 9, p 283
- Kretz Neoplasms in same Individual with Metastases Wiener klin Woch, 1892, No 11
- Krohn, Wilhelm Ueber Geschwulste der Submax Speicheldrüse Inaug Diss, Halle, 1899
- Kromayer, E Zwei Fälle von Endothelioma tuben Coll des, etc Virch Archiv, Band cxxxix, p 282 Zur Histiogenese der weichen Haut-naevi, Metaplasia von Epith zu Endothel Dermat Zeit, Band III, p 265
- Kühne Mischgeschwulste der Parotis Diss, Freiburg, 1895
- Küttner Beit z klin Chir, 1896, Band xvi
- Lambrecht et Gaudier Echo Méd du Nord, Tome I, p 19
- Landsteiner Mischgeschwulste d Speicheldrüsen Zeit f Heilkunde, 1901, p 1
- Langhans Casuistische Beit z Lehre von den Gefassgeschwulsten Virch Archiv, 1875
- Limacher, F Ueber Blutgefassendotheliome der Struma, etc Virch Archiv, Band cl, Supplementheft, 1898, p 113
- Linsler Verkalkte Epitheliome u Endotheliome Beit v Bruns, xxvi, 1900, p 595
- Lotheissen, G Ueber die Geschwulste der Gland Submax Beit v Bruns, 1897, Vol xix
- Lowenbach Z Kennt der Geschw der Submax Speicheldrüsen Virch Archiv, 190
- Lubarsch Ergebnisse Jahrg 1, Abt 2, S 366 Jahrg II, S 592 Zur Lehre v d Geschwulsten, 1899, p 233 Verh d Ges Deut Naturf und Aerzte, Band II, 1895 Arbeiten aus der Hygien Instituts zu Posen, 1901, p 205 Zeit f klin Med, 1902, p 491
- Marchand Verh d Deut Gesell f Path, 1899
- Mauclaire and Durrieux Tumeur mixte du voile du palais Bull Soc Anat de Paris, 1897, p 609
- McWeeny, E J Endothelioma (Tumor contained bone and cartilage) Trans of Royal Acad of Medicine in Ireland, Vol XII, 1895, p 366
- Melnikow-Raswedenkow Elastische Gewebe Beit v Ziegler, Band XXVI, 1899, p 546
- Meneau Un cas d'hématolymphangioma circonscrit Mém et Bull de la Soc de Méd, etc, de Bordeaux, 1894-1895, p 334
- Mikulicz and Kummel Krankheiten d Mundes, 1898, p 180
- Minot, C S Classification of Tissues Boston Society of Medical Sciences, December 19, 1899
- Mixter Boston Med and Surg Journal, 1896, p 137
- Morestin Traite de Chirurgie, par Dentu et Delbet, 1898, pp 296 and 406
- Morpurgo Endothelioma Atti della Accad delle scienze med e nat di Ferrara, Vol LXIX, 1895

- Mourie, Pierre Endothelioma (?) Contribution a l'etude du cancer primitif du voile du palais et de la luette Bordeaux These, 1895
- Mulert, Willy Die gutartigen Tumoren der Zungenbasis Diss, Wurzburg, 1895
- Nasse Arch f klin Chir, Band xlv, p 233
- Nicoladoni, C Adenom aus der Wange Deut Zeit f Chir, Vol 1, 1872, p 432
- v Ohlen Beit v Ziegler, Band xii
- Otto, Ernst Diffuse multiple Angio-Lipombildung mit Endothelwucherung Diss, Berlin, 1895
- Parmeijer Mixed Tumor of Parotid Diss, Leyden, 1901
- Peters Ueber Path Colomepithel Einstulpungen bei menschlichen Embryonen Verh d Deut Gesell f Gynak, 1897, p 524
- Picou et Ramond Splenomegalie primitive Arch d med exp, 1896, p 169
- Pitance These de Paris, 1897 (Quoted by Morestin)
- Polak, Daniels Stroma in Sarcoma Virch Archiv, Band clxv, p 238
- Pollack Arbeiten aus der Hygienischen Instituts zu Posen, 1901, p 160
- Pollman, L Ein Endotheliom der Pleura und des Peritoneums Ziegler's Beitrage, 1899, p 37
- Ponsot, R Tumeurs de la glands sous maxillaire These, Lyon, 1894-1895
- Pupovac, D Ein Beitrag zur Casuistik und Histologie der sogen Endoth Deut Zeit f Chir, Band xlix, 1898, p 77
- Pussacq-Larcebau, T B Étude sur les tumeurs benignes du Pharynx buccal et inferior These, Bordeaux, 1895
- Putiata Virch Archiv, Band lxi, p 245
- Ribbert Deut med Woch, 1896, No 1 Mallory Stain for Fibrous Tissue Cent f Path, 1896, p 427 Vierteljahresschrift d Naturf Gesell Zurich, 1896
- Riedel, W Pap Endothelioma Diss, Greifswald, 1898
- Ritter, C Fettgehalt in den Endotheliomen des Knochens Deut Zeit f Chir, Band l, 1899, p 349
- Roughton Tumors of the Palate (Nothing new) British Journal of Dental Science, Vol xxxix, 1896
- Sailer Primary Endothelioma of the Left Superior Pulmonary Vein Contribution from the William Pepper Laboratory of Clinical Medicine, 1900
- Schellong, C Ueber Geschwulste des weichen Gaumens Diss, Gottingen, 1897
- Schwalbe, E Endothelioma Vich Archiv, Band xlix, p 451
- Schwalbe, G Das aussere Ohr Bardeleben's Handbuch der Anatomie, 1898, p 149
- Scriba, M Endothelioma (Paper read at the XIIth Congress, Moscow) Centralbl f Chir, 1897, p 1039
- Spuler Ueber den feineren Bau der Chondrome Beit v Zieg, 1902, p 263

- Ssobolen Zur Lehre von d Endothel Neubildungen Virch Archiv, Band clxi, p 50 (Doubtful case from intestine)
- Steinhaus Mischgeschwulste der Mundspeicheldrüsen Virch Archiv, Band clxviii, 1902, p 233
- Stengel, Hans Ein Fall von Endothelioma Sarcomatosen des Oberkiefers Diss., Würzburg, 1896
- Sutke, H Beit z Keimt d Metastasen d prime Nieren-Carcinom Virch Archiv, Band clxviii, p 305
- Tanaka Ueber die klinische Diagnose von Endotheliomen und ihre eigen thumliche Metastasenbildung Deut Zeit f Chir, 1899, p 209
- Tervaert and de Jong Arch f Ohrenheilk, Band xliii, 1897, p 53 (Ear cases)
- Thorel Ergebnisse, Lubaisch-Ostertag, 1898, p 235
- Tusini, G Endothelioma (Two parotid tumors) Festschrift for Durante, Vol ii, p 85
- Unna Epithel Abkunft der Naevuszellen Virch Archiv, Band cxliii
- Vincentius, Carlo Endothelioma adiposa Rivista Clinica, 1893, No 7
- Volkmann Ueber endotheliale Geschwulste (Very complete literature up to 1896) Deut Zeit f Chir, Bd xli, 1895, p 1
- Waldeyer Endothel und Epithel Cinquantenaire de la Soc de Biol Vol Jubilaire, 1899, p 531 Arch f mik Anatomie, Band li, 1900, p 1
- Williams, Alice Journal of Experimental Medicine, Vol v, 1900, p 131
- Williams, H N Festschrift for Welch, 1901
- Wilms Embryome und Embryoide Tumoren des Hodens Deut Zeit f Chir, Band xlix, 1898, p 1 Mischgeschwulste, Heft 3
- Winkler, Karl Bethheiligung des Lymphgefasssystems an der Verschleppung boartiger Geschwulste Diss, Breslau, 1898
- Wlasso Sarcome angioplastique Virch Archiv, Band clxix, p 220, 1902
- Wojtkiewicz, S Knorpelhaltigen Auswuchse am Halse Diss, Zurich, 1900 (Contains a good discussion of the literature of the subject)
- Ziegler, H E Coelemfrage Verh d Deut Zoolog Gesell, 1898

OPERATIVE REMOVAL OF A TUMOR OF THE LIVER.¹

REPORT OF A CASE OF RESECTION OF THE LIVER FOR GUMMA, CHOLECYSTECTOMY

BY HERMAN ARTHUR HAUBOLD, M D,
OF NEW YORK,

Clinical Lecturer in Surgery and Demonstrator in Operative Surgery in the New York University and Bellevue Hospital Medical College, Surgeon to Harlem Hospital

THE case forming the basis for this report presents some interesting features with regard to the difficulties in arriving at a conclusion respecting the exact pathological process under observation after exploratory incision, and emphasizes how difficult it is to give a scientific and consistent prognosis in a given case until all the means to this end have been employed with care and deliberation. It also shows that an extensive portion of the liver may under certain conditions be removed without the occurrence of alarming or uncontrollable hæmorrhage, a consideration which has no doubt frequently deterred surgeons from making the attempt at enucleation of neoplasms in this situation.

History—M F, aged twenty-six years, married at twenty-one, has had two children with normal labor and two miscarriages at the third month, unattended with untoward occurrences. Denies absolutely any specific infection. Dr Louis Mooney, her family physician, went very thoroughly into this question with a negative result. Has always been slender and readily fatigued, but never seriously ill. Eight months ago began to suffer from distress and some dull pain in the epigastric region, the pain and discomfort are not influenced by ingesta, nor have there been any symptoms pointing directly to the stomach. About seven months ago she noticed a small mass on the right side corresponding to the anterior edges of the eighth and ninth ribs, the mass was not at first tender nor particularly painful, however, it steadily

¹ Read before the University Medical Society, December 7, 1903

increased in size, latterly the pain increased to a considerable extent, and recently has become sharp in character. Occasionally the patient vomited.

Examination, November 3, 1903—The patient is slender, rather anæmic, but not cachectic, there is no jaundice, and, except for a slight indolent papular acne on the face, the complexion is clear, the conjunctivæ are also clear. There is no palpable enlargement of the glands and the mucous surfaces appear healthy, no tenderness over the tibiæ, in fact there is no discoverable manifestation of ileus. The facial expression is serene and does not bespeak extreme suffering. The pulse and temperature are normal, the tongue is moist and clean. She has not vomited blood at any time nor passed any per rectum. The abdomen is normal in outline, though rather flat. At the site of the anterior edges of the right eighth and ninth ribs a mass about the size of an orange is readily palpable, it is apparently continuous with the liver, is hard, tender, and evidently adherent to the anterior abdominal wall. There is no symmetrical enlargement of the liver. The percussion note over the mass is flat.

The Diagnosis—Three things were considered,—cholelithiasis, duodenal ulcer, and neoplasm of the gall-bladder, liver, or pylorus. Regarding cholelithiasis, the pain is not paroxysmal, nor was there any history of gall-stone colic. A radiograph under exceptionally favorable conditions gave a negative result. Duodenal ulcer was excluded on the absence of hæmatemesis, also it was considered that, while a duodenal ulcer could give rise to a thickening of the pylorus and cause adhesion to the parietal peritoneum, it would probably be located lower down and would not reach the size manifest in this case. The case was believed to be one of neoplasm of either the gall-bladder or the liver tissue immediately contiguous to it, and in view of the age of the patient, the evident involvement of surrounding tissue (the peritoneum) was probably a sarcoma. Gumma, in view of the history, was not considered.

The Operation, November 10, 1903—Nitrous oxide-ether narcosis. Under narcosis, the mass was more readily palpable and seemed to extend towards the median line, consequently a celiotomy at the centre of the right rectus was made, and the mass found adherent to the parietal peritoneum from which it was readily separated. The view thus obtained showed a hard

mass the size of a large orange close to the gall-bladder. There was a narrow rim of normal liver tissue between the tumor and gall-bladder, and the latter, also the biliary ducts were normal, showing that the process was not the result of extension. The peritoneal sac was packed off with gauze, the mass seized with the left hand and rapidly enucleated by bluntly tearing through the surrounding normal liver tissue with the closed scissors. The trabeculæ of Glisson were clamped before division in order to control the branches of the hepatic artery. The venous hæmorrhage was considerable but not alarming, which was attributed to the fact that the larger venous trunks from the portal vein are located farther back near the transverse fissure, and in this case the field of operation involved the smaller ramifications in a portion of the organ aside and anterior to the track of the main blood-flow. Temporary tamponade with gauze saturated with hot saline solution effectually controlled the bleeding.

The gall-bladder was removed for the reason that when the mass was enucleated the thin layer of normal liver tissue separating it from the gall-bladder was also removed, this left the gall-bladder without support and a cholecystectomy was done. The cystic duct with its small artery was deligated, and the stump touched with pure carbolic acid. The wound in the liver was approximated with deep sutures of No. 2 chromic gut, a round needle of large size and full curve was used, the stitches showed no tendency to tear out. This latter measure effectually arrested the oozing from the raw surfaces of the liver wound. A drainage tube was carried down to the site of the liver wound and the superficial wound closed in the usual way. The patient reacted nicely from the operation.

At the time of the operation, the tumor was regarded as a sarcoma. The subsequent treatment of the case was that usually employed in abdominal section. Unfortunately, infection occurred in the track of the drainage tube, and the constitutional disturbances in consequence were for a time alarming. After thorough cleansing of the wound, this was arrested, and the patient made a rapid recovery.

Dr. Henry Rogers, who kindly made the microscopical examination, made a preliminary report that the tumor was probably a round-celled sarcoma, later, and after more extended examination, Dr. Rogers stated that the tumor was undoubtedly

a gumma It is to be borne in mind that there is no history of syphilis, that the woman at the time of the operation presented no discoverable evidence of the disease, and that the clinical diagnosis during the operative procedure was sarcoma The specimen was further submitted for examination to Professor E K Dunham and Dr Harlow Brooks, of the Pathological Department of the New York University and Bellevue Hospital Medical College, both of whom regard the growth as syphilitic

Ansuetz, in an article in the "Sammlung klinischer Vorträge," Nr 356-7, Leipzig, 1903, issued July, 1903, says that "resection of the liver for gumma has no sense, an exploratory celiotomy and the discovery of a gumma should be followed by immediate closure of the wound and subsequent administration of mercury and potassium iodide, an opinion in which Bergman concurs" If the case here reported is indicative of the difficulties encountered in arriving at a conclusion in the matter, it would appear safer to remove the neoplasm, more especially if the removal involve no dangerous surgical proposition Again, it is more than probable that a gumma of considerable size will not yield to constitutional treatment, and if the growth be situated near the gall-bladder and break down, very serious complications may be regarded as logical outcomes

With regard to the results of resection of the liver for neoplasm, an analysis of ninety-six cases collected by Anschuetz shows the following

Of the total ninety-six cases, seventy-five recovered, seventeen died from the operation Ten were done by excision, tamponade, and compression, one died Of seven done by thermocautery, all recovered, twenty-five done by excision and deep ligature, two died Of six done by preliminary clamping and excision, two died Of twenty done by intrahepatic ligature and excision, six died, and of twenty-four done by elastic ligature, six died Of the entire number, 12½ per cent were done for gumma, a fact showing that the admonition expressed by Anschuetz had not been regarded very frequently, probably

for the same reasons which obtained in the writer's case Of these twelve cases, two died, four were excised, and bleeding controlled by tampon, all recovered, one excised and the liver wound closed by suture, which recovered Seven were removed by elastic ligature, two died, and two were excised after preliminary intrahepatic ligature, both recovered The two fatal cases were reported, one by Tricomi, in 1895, in a woman forty-five years of age, who died on the third day from collapse, and the other by Tuffier, who removed the entire left lobe of the liver for multiple gumma in a woman of middle life The subsequent history of the case showed that no doubt the conclusion of the pathologist was correct After three weeks from the time of the operation, convalescence did not progress as rapidly as was expected, and the patient suddenly developed an urticaria of most distressing severity This was at first believed to be due to the disturbed intestinal function, owing to the fact that the biliary secretion had been disturbed by the cholecystectomy No doubt this was a factor in the case, however, a mild enlargement of the inguinal glands accompanied the skin manifestations, and, as the pathological reports arrived at about this time, the patient was subjected tounctions of 20 per cent oleate of mercury, with the result that her general condition improved at once The iodide of potassium was then ordered in rapidly increasing doses, and at the present time the patient's recovery is complete

THE APONEUROSSES THE SUPPORTING STRUCTURES OF THE ABDOMINAL WALL; THEIR APPROXIMATION FOR THE PREVENTION AND CURE OF HERNIA

BY KENELM WINSLOW, M D ,
OF SEATTLE, WASHINGTON

OF the various structures entering into the composition of the belly wall,—skin, fat, superficial fascia, aponeurotic laminae, muscle, transversalis fascia, and peritoneum,—the aponeuroses are the chief factors in the prevention of hernia. Neither the skin nor peritoneum offer much resistance to visceral protrusions, and that offered by muscles alone is not great when unprotected by fibrous covering. Witness hernia of muscle itself when, for instance, the sheath of the rectus is wounded. The protection of viscera and the production of movements constitute the principal rôle of the four flat abdominal muscles. The bellies of the transverse and oblique muscles fill in the space between the lower borders of the costal cartilages and the crest of the ilium on the sides of the abdomen, where hernia is least apt to occur, while behind this point the aponeurosis of the transversalis divides into three layers separating and giving support to the lumbar muscles. Anteriorly, the aponeurosis of the oblique and transverse muscles cover and support the whole front of the belly for an area extending from without the borders of the recti on the sides, and from the ensiform cartilage to the pubes in front. The aponeurotic layer of the external oblique is of the greatest importance, stretching, as it does, from beneath the pectoral muscles over the recti to the symphysis, and from the crest and anterior superior spine of the ilium to the spine of the pubis, forming Poupart's ligament and the pillars of the abdominal ring. It is mainly owing to weakness or faulty approximation of this structure that hernia results. The apo-

neurosis of the internal oblique, beginning well outside the rectus, divides into two layers at the outer border of the upper three-quarters of this muscle, one layer passing in front and the other layer behind the rectus to form its sheath, and uniting in the middle line

While in the lower quarter of the rectus the aponeurosis of the internal oblique does not divide, but passes over the front of the muscle. The aponeurosis of the transversalis is broad, its upper three-fourths passing behind the rectus, blending with the aponeurosis of the internal oblique in front and the transversalis fascia behind, while its lower fourth passes in front of the rectus and, with the upper three-fourths, is inserted in the middle line (Fig 1). All the aponeurotic layers pass in front of the lower fourth of the rectus, none behind this part.

The linea alba, formed by the blending of the transverse and oblique muscles, is wider above, and is of considerable breadth here when the abdomen has been distended, as by pregnancy. In operations for umbilical hernia or separation of the recti, the linea alba will often be found to afford sufficient tissue for making flaps without encroaching on the sheath of the rectus. As there is an aperture in the aponeuroses at the umbilicus, hernia in this region is only covered by peritoneum, transversalis fascia, and skin in most instances, but when, owing to separation of the recti, a large area of aponeurosis exists in the middle line, it will not uncommonly be found that this enters into the covering of umbilical hernia, particularly in large herniæ which have encroached upon the abdominal wall. In these it is especially necessary to find sufficient material for flaps in performing overlapping of the aponeurosis, therefore part of the base of the sac, composed of peritoneum and aponeurosis, may be utilized for this purpose. In a recent case of operation for ventral hernia with diastasis of the recti, it was noticed that the hernial covering consisted only of skin and peritoneum in the most central and superficial part, while about the periphery the aponeurosis entered into its composition. This was an incisional hernia following an operation

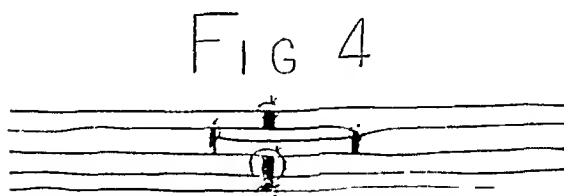
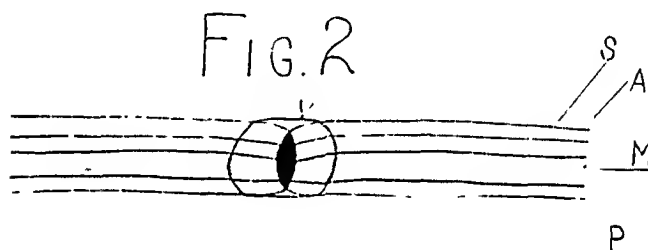
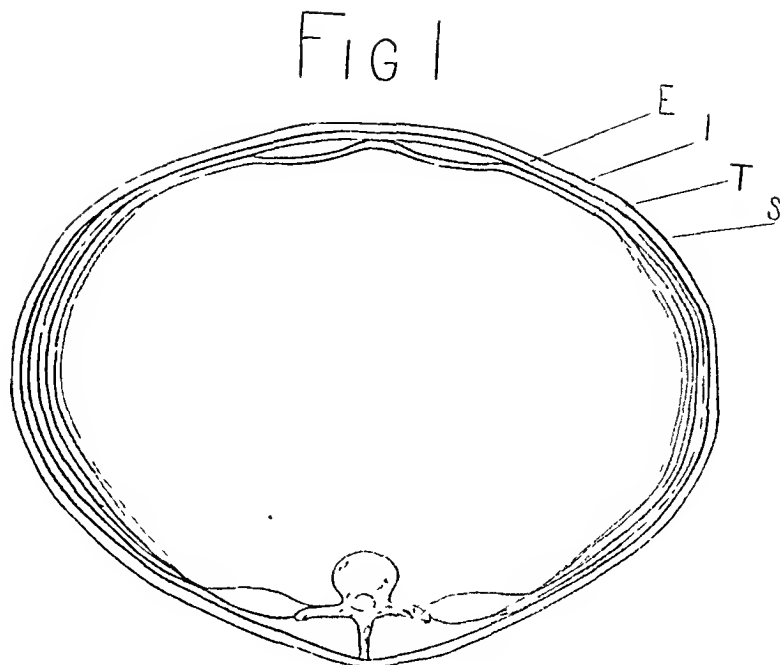


FIG. 1.—Cross-section of abdominal parietes showing the arrangement of aponeuroses in the upper three-fourths of the belly. E. Aponeurosis of external oblique. I. Aponeurosis of internal oblique. T. Aponeurosis of transversalis. S. Skin.

FIG. 2.—S. Skin. A. Aponeurosis. M. Muscle. P. Peritoneum. Mass or through-and-through suture of abdominal wall showing thinning of wall through tension of stitches and direct line of broad scar tissue from peritoneum to skin. More or less puckering of the layers and lack of or faulty approximation of the aponeurosis—which are not uncommon—are not shown.

FIG. 3.—Suture of the abdominal wall by layers. There is good approximation of like structures, but a weak spot in the direct line of the cicatrix from peritoneum to surface, which often results in hernia.

FIG. 4.—Closure of the abdominal incision by overlapping the aponeurosis. There is no direct line of scar formation from peritoneum to skin, but instead there is a doubling of the strongest layer in the wall interposed right in the path of hernia. The broad line of union between the flaps of aponeurosis making a breaking down of the wound an impossibility.

done in the middle line some years before by an unknown operator, and the result showed the effect of not properly approximating the aponeurosis in closing the incision

Let us now consider the more common methods of making and closing the abdominal incision so far as they relate to the prevention and cure of hernia. We will analyze them from two points of view: 1. Their anatomical correctness. 2. Their clinical results. In the case of the earliest method, that of the so-called through-and-through or mass suture penetrating all layers of the wall from peritoneum to skin, several faults are apparent. Like structures are not accurately approximated, the peritoneum may be separated by bulging muscle, the aponeurosis is not properly coapted, the layers are puckered and suffer considerable tension at points where the stitches are placed resulting in thinning of the walls. Faulty approximation leads to a wide scar formation, and this, being weak tissue and extending in an unbroken line from peritoneum to skin readily yields and gives rise to abdominal hernia which has been justly styled the "one blot upon abdominal surgery" (Fig 2). Indeed, so late as 1895, Winter in *La Semaine Médicale*, relates that postoperative hernia had resulted in about one-third of 1000 cases of laparotomy done in the various hospitals of Berlin by the older method of mass suture.

Next came suturing of the separate layers or tiers. While it is true that by this procedure close approximation of like tissues, freedom from tension, and a linear scar are secured yet the cicatricial tissue being continuous in the line of incision through the whole substance of the wall, hernia is a frequent occurrence. For example, such excellent operators as Bull and Coley report twelve relapses out of twenty-one cases of ventral and umbilical hernia done as Coley writes me, by suture of separate layers. These cases are, as a rule extremely unfavorable in possessing exceptionally weak walls, but when we compare this result with that of almost complete success in similar cases obtained by overlapping the aponeurosis we find that the comparison does not reflect credit on suture of separate layers alone as a means of preventing or curing hernia in weak ab-

dominal walls (Fig 3) "Comparisons are odious," but often instructive

A modification of the suture in tiers is a common procedure among German operators in performing abdominal incisions. This consists in dividing the various layers in the same parallel lines, but in different vertical planes. Thus the incision through the aponeurosis and muscle would not be made immediately under the skin incision, but a little to one side, while that in the peritoneum would not be done immediately beneath the division of the aponeurosis and muscle, but a little to one side under the skin incision. This method results in the formation of linear scars which are immediately superimposed by sound tissue in the layer above,—a considerable advance in the way of affording increased resistance to intra-abdominal pressure.

Later came the devices, as McBurney's and Stimson's, which, while retaining the method of apposition in layers, so perform the division in making the abdominal incision that the lines of incision, and therefore union, cross each other. Thus the common name of "gridiron incision" for McBurney's operation for appendicitis. In this incision, as is so well known, the skin and aponeurosis of the external oblique are divided in a line parallel to the latter's fibres over McBurney's point, and then the internal oblique and transversalis muscles are separated by blunt dissection in the direction of their fibres, which extend at almost right angles beneath the incision in the external oblique. In the last step the peritoneum is divided in the same line as the muscular separation. It is an almost ideal operation anatomically in that there is no transverse division of muscular or nerve fibres, and in the fact that muscular contraction closes the opening in the belly wall. The only weak spot is at the intersection of the lines of incision, and this is so small as to be negligible. For the prevention of hernia, this operation is wellnigh perfect. I can find but one case of hernia following it in looking over the literature upon the subject. While it requires more skill and time than the ordinary incision, or the method of overlapping to be described, it is used

almost exclusively by the best operators in clean cases and by a great number in abscess cases as well

Lewis A. Stimson's laparotomy incision for the prevention of hernia comes within the same class as the McBurney operation, since it is a method of suture by layers with the lines of incision crossing in different tiers of tissue, and pursuing in a general way the natural direction of their fibres. The incision is nearly hemispherical with its convexity downward, beginning about an inch above the symphysis, it is carried upward on either side towards the anterior superior spine, the length of the incision varying directly as the thickness of the wall, through the aponeurotic covering of the rectus, and, outside this muscle, through the aponeurosis of the external oblique. A flap of aponeurosis and integument is dissected from the rectus and turned up on the belly, and below the incision the aponeurosis is freed to a slight extent also. The recti are then separated, and the peritoneum is opened by a vertical incision in the middle line. In closing, the peritoneal line of sutures crosses the line of sutures in the tiers above, and we find in this procedure the analogue of the McBurney operation in its anatomical method and clinical results. No evidence of hernia has arisen in over fifty cases done by Stimson after his plan.

Brief mention might be made here of the silver-wire netting or filigree used so ingeniously by Phelps, Willy Meyer, and recently to good purpose by Bartlett (*ANNALS OF SURGERY*, July, 1903). Such a mode of support has of course no natural anatomical basis, and but limited surgical application, though of undoubted value in those exceptional cases in which it is unfortunately appropriate. It does not appear to be appropriate as a routine treatment of herniæ, since, acting as a foreign body, the silver wire tends to set up suppuration and sinus-formation, which weaken the wound and defeat the very object for which the wire netting is used. The indication for the netting is to reinforce the abdominal wall in cases where, owing to thinning out of stretched structures entering into hernial orifices, or to removal of diseased tissue, normal approximation of the abdominal wall cannot be secured. Some-

what similar comments in regard to their general application might be made of the McBurney and Stimson operations, though having a much wider sphere than the foregoing. Both are admirable in their place, but this is limited to the sites in which these operations are done, and both are restricted to the prevention of hernia.

I have emphasized the fact that the aponeuroses are the structures of essential importance in the operative prevention and cure of hernia of the abdominal wall, and therefore any method which has for its basis not only careful approximation of these parts, but the actual doubling of the strength of the wall by overlapping of the aponeuroses, must be anatomically most perfect. As examples of such procedures we have the operations of Lucas Championnière and Halstead for the cure of inguinal and that of Mayo for umbilical hernia. The first steps of the Championnière operation are the same as regards incision, treatment of the sac, etc., as in the Bassini operation, but in closing the wound, overlapping is secured by drawing the lower flap, consisting of the aponeurosis of the external oblique, up and under the upper flap by means of mattress sutures and bringing down the upper flap over the lower flap and stitching it to Poupart's ligament. The upper flap consists of the internal oblique, the aponeurosis of the external oblique, and, in the lowest angle of the wound, the conjoined tendon and the margin of the rectus. The cord is so displaced that it lies above the external oblique and under the skin. Championnière's record was recently reported to be 868 operations, with thirty-eight relapses (4.3 per cent) and no deaths. This is better than the average results of the Bassini operation (about 5 per cent of relapses).

Halstead practises a similar overlapping of the aponeurosis of the external oblique in his improved and perfected operation for inguinal hernia. After the internal oblique has been drawn down and stitched to Poupart's ligament, the external oblique is overlapped by inserting mattress sutures near the edge of the lower flap of the aponeurosis and carrying the sutures through the upper flap from behind and an inch or so

from its free border, and by means of these sutures drawing the lower flap of aponeurosis up under the upper flap and tying them on its surface. The free margin of the upper flap is then brought down over the lower flap and stitched to Poupart's ligament. The cord is not transplanted, but lies beneath the cremaster muscle, which is overlapped by the internal oblique, while the latter is covered by the overlapped aponeurosis of the external oblique, a double doubling of the layers. Results speak louder than words. Halstead has had no recurrences following his operation for inguinal hernia in over ten consecutive years. (For description and excellent plates of this operation, see *Johns Hopkins Bulletin*, August, 1903.)

Mayo's operation for the cure of umbilical hernia consists in surrounding the hernial protrusion by two horizontally elliptical incisions carried down to the aponeurosis of the external oblique, leaving this for an area of two and one-half to three inches in all directions about the neck of the sac, excising the sac and omentum, returning the bowel after separating adhesions, widening the ring by transverse cuts extending for an inch on either side of the ring, and, finally, overlapping of the aponeurotic margins of the ring from above downward for some two inches. The lower aponeurotic margin of the ring is drawn up under the upper aponeurotic margin by mattress sutures of silk after the peritoneum has been dissected from the upper lip and approximated to the peritoneal edge of the lower lip. Anatomically, this operation doubles the strength of the strongest structure of the abdominal wall, it avoids the necessity of tension, in approximating the borders of the ring, which has heretofore made the operation for umbilical hernia a byword and reproach in the way of mortality; and, finally, by this mode of closure, intra-abdominal pressure only tightens the hernial aperture by exerting force usually in a horizontal direction. This follows because the typical belly of umbilical hernia is long and pendulous in the vertical direction, and because intra-abdominal pressure acts along horizontal lines as may be seen in the stretching of scars in the transverse and not in the vertical direction of the belly. Occa-

sionally, however, in umbilical hernia, it is only feasible to overlap the aponeurosis from side to side in those exceptional cases where the long axis of the elliptical opening forming the hernial ring is vertical and not horizontal. In a recent personal operation such was the condition and mode of closure, it being impossible to overlap in the vertical direction.

Mayo's paper at the last annual meeting of the American Medical Association (*Journal of the American Medical Association*, July 25, 1903) fully described and illustrated the operation, and reported thirty-five cases of umbilical hernia operated on by overlapping of the aponeurotic margins of the ring, with only one partial relapse and no deaths. Over against this remarkable record we may put the results of operations by former methods in the hands of the best operators with 50 to 75 per cent of relapses in the case of large umbilical herniæ, and with a mortality of 50 per cent in strangulated cases. Busse writes of twenty-two cases of operations for umbilical hernia performed during the five years prior to 1901. The mortality was 10 per cent in all, 25 per cent in the incarcerated cases, and suppuration in none. He gives the following summary of fifteen of these cases, whose after-history was traced: 1. That 75 per cent of the large herniæ relapsed (from a double fist to a man's head in size). 2. That 50 per cent of the medium-sized herniæ relapsed (from the size of a small apple to a goose-egg). 3. That among the cases having small herniæ there were no relapses (from the size of a hazel-nut to that of a walnut). Coley, in presenting and commenting upon this paper ("Progressive Medicine," June, 1903), remarks, "These figures demonstrate the great importance of early radical operation, it being evident that the chances of a permanent cure decreased with the size of the hernia. Busse states that it is only in small umbilical herniæ that a definite cure can be guaranteed. This is the opinion that Dr. Bull and myself have long held." However, Dr. Coley, in a recent letter to me, shows a more hopeful spirit in view of Mayo's wonderful success.

Another mode of overlapping has been independently

practised by Blake, Piccolo, and Sapiejko. This is done in the neighborhood of the umbilicus by overlapping the opposing margins of the recti with their aponeurotic coverings for the cure of hernia in this region. The superfluous skin, umbilicus, and sac are removed by two vertical, elliptical incisions, after treating the hernial contents as seems proper. The aponeurosis over the recti is cleared of fat for the space of a few inches about the hernial orifice, and the peritoneum is dissected away from the borders of the recti and united by suture, or, if this is impossible, the muscles may be overlapped with their peritoneal coat intact. The hernial opening is slit upward and downward in the middle line as far as, but not through, the peritoneum, so as to make it vertically elliptical. Mattress sutures are then passed through the margins of the underlapping muscle and brought out at a suitable distance from the margin of the overlapping muscle, pulled tightly and tied. The edge of the overlapping muscle is tacked down to the aponeurosis of its fellow as in Mayo's operation. This procedure would not be safe or possible in many cases where one has not only to return a large mass of bowel into an abdominal cavity unused to contain it, but must at the same time lessen its capacity. It is as if a man wearing a skin-tight, single-breasted vest should eat an enormous meal, and then be compelled to wear it as a double-breasted garment. Then, unlike the operations of McBurney and Mayo, the action of the recti muscles tends to draw the muscles asunder in this method of approximation. In certain appropriate cases, where transverse laxity of the abdominal wall will permit of the operation, its success warrants its use.

When we see how wonderfully successful have been the special operations of Halstead, Mayo, and Championnière by the method of overlapping the aponeurosis for the cure of hernia, why should we not apply the same principle to the closure of *all abdominal incisions* for the *prevention* of hernia? For instance, I believe that the incision for appendectomy is more properly closed by this method than by any other. It is more easily and quickly done, is more appropriate in afford-

ing the greatest amount of room in diffuse abscess, and will be found to give as good results as the more difficult McBurney operation. Incisions for attacking the gall-bladder and ducts, the common middle-line incision, and incisions in any part of the belly wall can be closed to best advantage in consonance with anatomical reasoning and clinical results by this method. I desire to call particular attention to the fact that overlapping of the aponeurosis has the widest kind of applicability in abdominal surgery.

There is scarcely any abdominal incision which cannot be closed most successfully by this means to avoid hernia. Dr C. H. Mayo, of Minnesota, writes me, "The overlapping method you mention for hernia and appendix operations we use constantly, and like it very much." In hernia with separation of the recti, and in epigastric and all ventral herniæ, it is *the* operation par excellence.

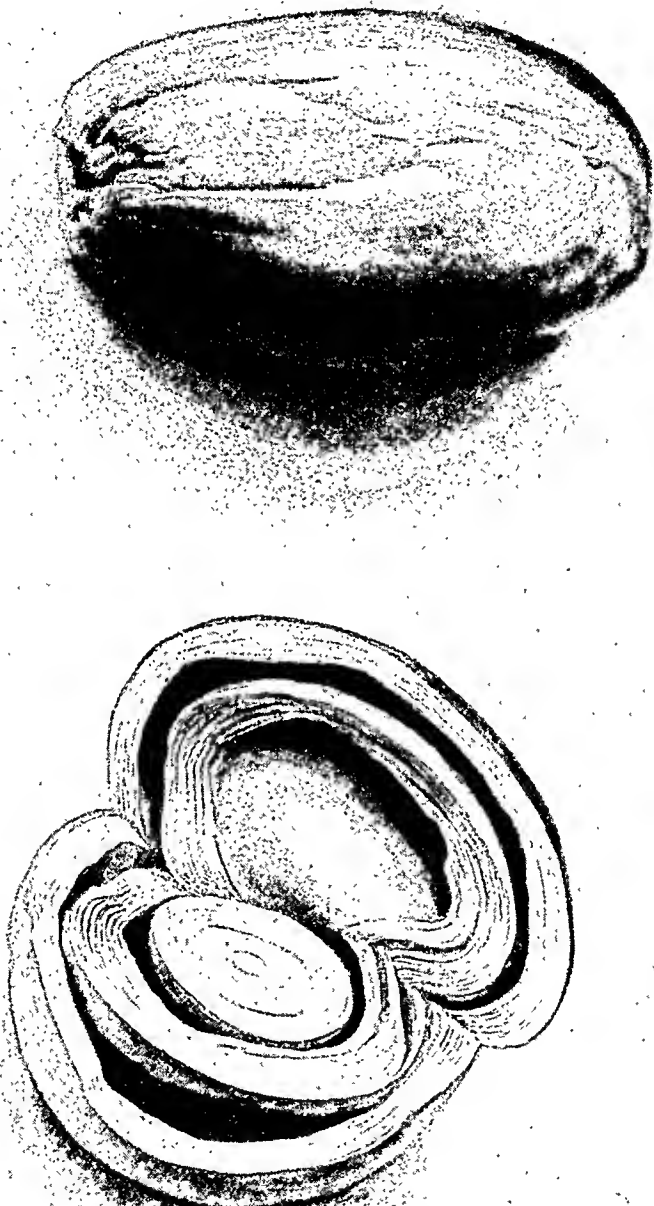
It has been the object of this paper to study the anatomy of the supporting structures of the abdomen and the various modes of approximating these structures in the closure of abdominal incisions in order to prevent or cure hernia of the belly wall. As a result of our study, we may formulate the following conclusions:

First That the aponeurotic coverings are the chief supporting structures of the abdominal wall.

Second That their approximation by overlapping, in doubling the strength of the aponeurotic layers, doubles the strength of the abdominal incision.

Third That this being so, and the overlapping method being proved the best mode of curing abdominal hernia, it follows that, as prevention is better than cure, it is wiser to *prevent* hernia by employing this principle in closing all abdominal incisions than to be forced to use it later to cure post-operative hernia.

The following is a description of the technique employed for the prevention of abdominal herniæ by overlapping the aponeurosis. This applies to the closure of incisions made in the middle line or for attacking appendix, gall-bladder, etc.



FIGS. 1 and 2.—Fibrinous concretions about a calcic phosphate nucleus. From bladder.

The integument and subcutaneous tissue are incised down to the aponeurosis. The aponeurosis is bared by reflecting back the skin and fat for a space of an inch and a half on each side of the incision. The aponeurosis is next incised in the same line and directly beneath the skin incision, and two flaps, one on each side of the incision, are raised from the underlying muscle by blunt dissection. One flap of aponeurosis is freed for an inch or so from its cut margin, the other for about half that distance. The incision through the rest of the abdominal wall is completed as usual. In closing, the peritoneum is approximated by a continuous suture. It may be wise in weak, fatty walls to now introduce two or three retention sutures placed well back from the margins of the wound and penetrating all layers above the peritoneum. The muscle, if well developed, is coapted by interrupted sutures. Then the cut edge of the aponeurotic flap, which was but slightly freed, is stitched to the base of the opposing flap (Figs 5 and 6) by interrupted or mattress sutures. The free margin of the opposing flap is lapped over the other one and stitched down to the surface of the aponeurosis by interrupted or continuous suture. A diam of gauze wrapped about with rubber tissue, or a roll of rubber tissue alone, leading from the lower angle of the wound should be inserted between the fat and aponeurotic layer in cases where there has been much manipulation or where the adipose tissue is thick. The skin may be coapted with the Michel clamp, buried silver wire, or other suture. The retention sutures are of silkworm gut, medium catgut is used for the lower layers plain in the case of the peritoneum chromicized for the muscle and aponeurosis. The retention sutures, if used, are employed merely to support the wall until the dangers of vomiting and meteorism are passed and union has begun.

FIBRINOUS VESICAL CONCRETIONS

REPORT OF A CASE IN WHICH TWO LARGE FIBRINOUS CONCRETIONS WERE
REMOVED FROM THE URINARY BLADDER.

BY JOHN WHEELOCK ELLIOT, M D ,
OF BOSTON, MASS ,
Surgeon to the Massachusetts General Hospital

THE following case, so far as I know, is unique

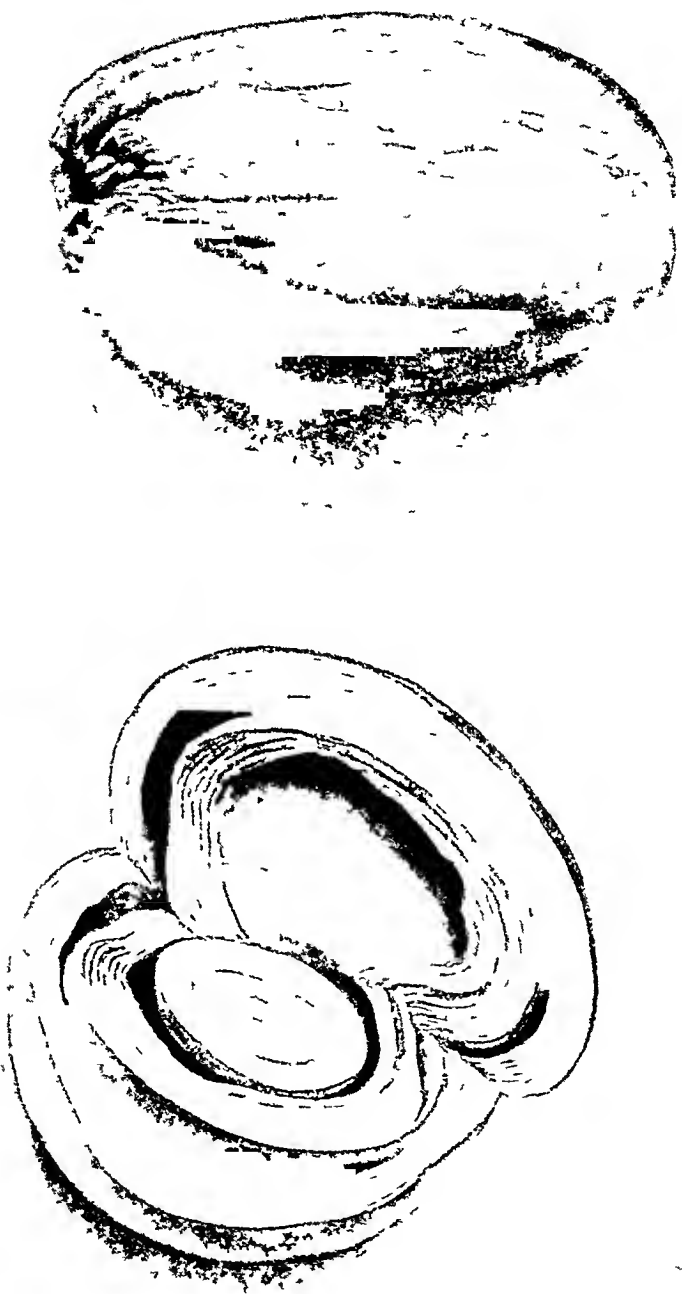
The patient, Mr F , fifty-four years of age, single, fish-dealer, was admitted on November 3, 1902, to Dr J C Warren's service, at the Massachusetts General Hospital, with the following history

Six years before entrance he had been seized with severe pain in the abdomen, rolled on the floor, and vomited This pain lasted for two days, confining him to bed for a week Since then has had several attacks of a similar nature During the attacks his urine was very bloody Three years ago he passed a small stone In September, 1902, he had four attacks with severe vomiting, the last one ten days before entrance Pain starts in the left flank and goes down into the groin, at times as far as the testicle, passes water every half-hour Examination negative No stone could be felt with the searcher X-ray and urinary examination negative While in the wards he passed a small stone per urethra

Dr Warren operated for right inguinal hernia, from which operation he made an uninterrupted convalescence

Patient re-entered the hospital on February 18, 1903, in Dr Elliot's service Since discharge has had more or less trouble with his water, at times the urine is bloody, with severe tearing pain, lasting for about ten minutes, and coming on at the time of micturition Occasionally the urine shuts off abruptly Micturition is greatly increased in frequency Six days before entrance he passed bright red urine with clots Examination by Dr Elliot with finger in the rectum showed a slightly enlarged prostate, which was tender

On the 19th, operation by Dr Elliot Stone searcher introduced into bladder, but nothing found Bladder washed with



FIGS 1 and 2.—Fibrous contractions about a central phosphoric nucleus. 1 mm bi index

Bigelow evacuator No clicking On introducing two fingers into the rectum, a mass at the base of the bladder could be plainly felt by bimanual palpation A suprapubic operation was done after the bladder had been filled with water The bladder wall was found to be extremely thin On opening it and inserting the finger, two large, ovoid, smooth, soft masses could be felt about the size of small hen's eggs These two masses moved freely and were found to be free in the bladder They were elastic to the feel After introducing a retractor, both of them were removed with ease The bladder was otherwise normal A rubber tube with gauze packing was inserted into the bladder, and a catheter through the urethra Convalescence uneventful On section of one of these ovoid masses, a small stone was found in the centre, surrounded by layers of laminated fibrin (Figs 1 and 2)

Drainage tube removed from the bladder on the fourth day Catheter removed on fourteenth day Discharged, March 22 May 18, feels perfectly well, has no frequency of micturition

The following is the pathological report by Dr Whitney on the specimens removed

Two egg-shaped bodies removed from the bladder, the larger measured 6.5 by 3.75 centimetres and the other 5.5 by 3.5 centimetres They were of a lightish yellow color, with smooth surfaces, slightly wrinkled, and of the consistency of firm putty The larger weighed forty-five grammes and the smaller twenty-seven grammes

On section the structure was found to be laminated, between some of the layers of which were spaces which may have been occupied by fluid

The structure was homogeneous, slightly gritty, giving the impression of coagulated material, fibrin and mucus, mixed with particles of urinary salts, in the centre of which was a small nucleus which measured about 2.5 centimetres in greatest extent, composed of inorganic material, which on the analysis of Professor E. S. Wood was found to be composed "chiefly of calcic phosphate, with trace of calcic carbonate and triple phosphate, and débris of inorganic material"

Fibrinous concretion about a calcic phosphate nucleus

PARTIAL ENTEROCELE¹

BY LUCIUS W HOTCHKISS, M D ,
OF NEW YORK CITY,

Surgeon to the J Hood Wright Hospital, Assistant Surgeon to Bellevue Hospital

PARTIAL enterocele, or hernia in which only a portion of the gut wall is pushed into the hernial sac, is as interesting as it is rare

Its mode of production is still a matter of dispute, as the condition must be clearly distinguished from the true intestinal diverticula. Whether these cases sometimes begin from a pre-formed false diverticulum, or always acutely as an accidental strangulation of some portion of the wall of the small intestine, is still a mooted question, and one mainly of academic interest.

To the surgeon it presents itself as a form of strangulated hernia, most dangerous because of the lack of typical symptoms. The hernial sac in these cases is generally small, its contents a portion of intestinal wall, and omentum very exceptionally. With dense and unyielding walls and a narrow aperture in which the partial enterocele is caught, the strangulated portion of the gut wall soon loses its vitality, and gangrene, perforation, and general peritonitis even, may ensue, before the case assumes clinically the appearance of real gravity.

In some of the reported cases a pre-existing hernia has been present, but in the majority it is very small or entirely unnoticed, until, after some unusual strain perhaps, a small swelling develops at the site of one of the hernial openings and becomes painful. From the fact that only a portion of the intestinal wall is engaged in the neck of the sac, the typical signs of acute intestinal obstruction, so early developed in ordinary cases of strangulated hernia, may not appear until late, or until the inflammation with its accompanying swelling has spread to and involved the unstrangulated portion and led to its complete occlusion.

¹ Read before the New York Surgical Society, October 14, 1903
258

The portion of intestinal wall involved in partial enterocele is generally the convexity opposite the mesenteric attachment. The lateral wall, however, may be the seat of strangulation, simulating a true diverticulum, or even the mesenteric border of the gut may be implicated.

When such a hernia does occur, it must be evident, from its very nature, that the interference with the circulation in the involved portion of the gut must soon be followed by swelling and infiltration of its tissues, by the outwandering of the intestinal bacteria through the damaged gut wall, and a general infection of the sac and contents. Adhesions between the gut and the neck of the sac protect the general peritoneum from infection for a little time, but finally this feeble barrier is overcome and a general peritonitis rapidly develops. This course of events is admirably illustrated in one of the cases to be reported.

Since the conditions in strangulated partial enterocele are such that considerable damage to the intestinal wall is bound to have occurred before the diagnosis is made or an operation undertaken, resection of the gut will of necessity have to be resorted to in most of the cases as an essential part of the treatment. The following cases drawn mostly from the records of the J. Hood Wright Hospital serve to illustrate some interesting points in connection with the diagnosis and treatment of this rather unusual and very dangerous form of hernia.

CASE I—*Strangulated Inguinal Hernia (Partial Enterocele), General Peritonitis*

W. H., twenty-two years, January 10, 1898. Seen in consultation with Dr. J. A. Jenkins four days ago seized with acute abdominal pain and vomiting, pain became more severe and constipation absolute. Seen by Dr. Jenkins thirty-six hours later, cathartics given without result, pain and vomiting continued, distention of the abdomen developed and his condition became steadily worse.

Examination—Patient looked very ill, face pinched and drawn, pulse rapid, temperature, 101° F., abdomen distended and markedly tender over the right side. Right rectus tense

Examination of inguinal canal on right side revealed what seemed to be an enlarged and tender cord. Patient had a hernia twelve years before, which was supposedly cured.

His physician regarded the case as one of obstruction. In view of the temperature, tenderness, and apparent peritonitis, a diagnosis of appendicitis with peritonitis and obstruction from paresis of gut was made. Immediate operation. Under ether narcosis, marked right-sided abdominal rigidity was apparent, and an elongated mass was felt low down in the right inguinal region. An oblique right-sided incision was made over mass and the peritoneum opened. There was considerable free serum in the abdominal cavity, the intestinal coils were congested and distended, and in separating them to search for the appendix a loop of gut was found apparently adherent to the right internal abdominal ring. This was freed easily and found to be a strangulated partial enterocele. Intestines washed with saline solution after partial evisceration, and the damaged loop of gut, in view of the patient's bad condition, was not resected, but packed off with gauze and left in the bottom of the wound. Dressing changed next day. A very free oozing of serum had taken place. Condition growing worse. Temperature, 103° F. Peritonitis progressed and patient died the following day.

CASE II—*Strangulated Inguinal Hernia (Right Partial Enterocele), Gangrene of Gut, Resection, Murphy's Button Pneumonia, Thrombosis of Left Saphenous Vein, Recovery*

H. S., nineteen years, admitted to hospital January 4, 1899, at 4 05 A. M. by ambulance. Noticed a small incomplete right hernia one year ago. Has been subject to cramp-like pain in bowels. The day before admission, he began to have abdominal pain, nausea, and vomiting, and noticed a swelling at the site of the right inguinal ring. Bowels moved yesterday A. M. Vomited three times before admission. On admission he complained of epigastric pain, and has had no movement for twenty-four hours. Enema brings away fluid but no gas. Legs drawn up and looks sick. Examination reveals small tumor filling the upper part of the right inguinal canal and coming down to the upper end of scrotum. This swelling is tense but not tender, and there is distinct impulse on coughing. There is marked tenderness at the site of the right internal abdominal ring, but not elsewhere. There is no abdominal distention.

A hot bath was given and moderate taxis made, but unsuccessfully Rectal tube brought away some gas Operation, 4 P M, January 4, 1899 Ether Oblique inguinal incision Small hernial sac found in the upper end of scrotum, this was incised and a small amount of brownish fluid with slight odor evacuated In the upper end of this sac there was a small knuckle of gut firmly grasped and lightly adherent Division of the constriction allowed the gut to be pulled down and a typical Richter's hernia demonstrated A small portion of the wall of the small intestine had been pushed into the internal ring and become strangulated This area was dusky and surrounded by a well-marked ring of necrotic tissue, which was separated from the rest of the healthy wall of the gut The mesenteric vessels leading from it were thrombosed, and there was no evidence of vitality after washing in warm saline solution The site of the hernia, with about four inches of gut, was therefore resected and the gut's ends united by the Murphy button Sac tied off and Bassini's operation done Patient made a good recovery from the operation, and the condition of the wound at the dressing next day was satisfactory On the sixth day of January, two days after the operation, a right lower pneumonia developed, and on the same day a large tapeworm was passed Ninth of January wound was dressed, slight faecal odor from the discharge Wound opened and a wet dressing applied Sixteenth of January Murphy button passed Twenty-fourth of January wound granulating, secondary sutures and strips Twenty-eighth of January thrombosis of the left internal saphenous vein developed, with pain and swelling of the lower extremity involved This condition cleared up in a few days, however, and the patient made a good recovery, being discharged as cured March 12, 1899

CASE III—*Strangulated Partial Enterocoele, Operation, Reduction, General Peritonitis, Secondary Operation, Death*

A A, thirty-five years, admitted to hospital service of Dr Le Boutilier, October 13, 1902, with the following history Has had a left inguinal hernia for three years, had not worn a truss nor had any trouble until ten days before, when he was seized with severe pain in the region about the umbilicus and began to vomit, which vomiting has continued, and lately has developed a faecal odor Bowels have moved once in this time Examination on admission, patient looked very ill, face drawn and

anxious, pulse weak, tongue dry and brown. Abdomen somewhat distended, and patient complains of pain about the umbilical region, where there is also some tenderness. There is also some general abdominal tenderness. At the site of the left internal abdominal ring there is a small, painful, irreducible swelling, which gives no impulse on coughing. Temperature, 99° F, pulse, 96, respiration, 20, urine, negative. Immediate operation by Dr Campbell, the House Surgeon, under instructions of Dr Le Boullieu, attending surgeon. The stomach having been washed out, gas and ether were given, and an oblique incision made over the left inguinal canal, a small, tense, and rather thick hernial sac was found, from which, on being opened, a small amount of dark-colored fluid with slight odor was evacuated, five inches of omentum, also dark-colored, and a small knuckle of dark-colored gut slightly constricted at the neck of the sac was found. On incising the point of constriction at the neck of the sac, it was found that only a portion of the wall of the gut had been strangulated. This portion was black, but, as its color returned somewhat under hot saline solution irrigation, it was reduced. The omentum was ligated and excised, and the sac having been tied off the operation was completed as a typical Bassini's. After the operation fecal vomiting occurred, but the next day the condition had much improved, there was a good result from an enema, and no vomiting. The patient steadily improved up to the 16th, when the temperature rose to 102° F and the pulse to 120, but there was no general tenderness or distention. On the 18th distention and tenderness were evident, and about noon vomiting began and distention became more pronounced. Gas and some fecal matter in response to enema, as condition did not improve at 6 P M, the belly was opened, and incision of the peritoneum followed by escape of gas and feces. Saline irrigation of peritoneum. Temperature rose to 107° F. Died at 1 P M, 19th.

'CASE IV—*Strangulated Inguinal Hernia, Partial Enterocoele, Gangrene of Gut, Perforation, Resection, End-to-End Anastomosis by Maunsell's Method, Died*

P F, forty-eight years, admitted to hospital January 28, 1897, walked in. He has had a reducible hernia since boyhood, and it had never troubled him up to ten years ago, when for a time it became irreducible. After this he wore a truss, which had held it up well until three days before, when it grew larger, and

was no longer retained by the truss, and became irreducible. Vomiting and some pain ensued, but the bowels moved the next day, though not since. Vomiting has continued, but is not very frequent. Examination by the House Surgeon, who found what seemed to be an inflamed irreducible hernia. Sac not tense nor especially tender. Temperature, 101.6° F, pulse, 100, urine, negative. Put to bed, ice-bag applied locally. During the night some hiccough and felt weak. Next day, enema effectual, temperature falling. January 30, A.M., temperature normal, looks very badly. Operation, 2.30 P.M. Ether.

Usual incision was made over the hernial sac, which was not tense, and the sac was opened. Brownish faecal-smelling fluid evacuated. A small knuckle of gut firmly grasped in the upper end of sac, was gangrenous, and showed a small perforation. Sac washed out, gut released, strangulated area resected, and ends joined by Maunsell's method of anastomosis, after an unsuccessful attempt with the Murphy button on account of the difference in size and thickness of the proximal and distal ends of the gut. Wound closed by Bassini's method, with drainage at angles on account of the faecal contents of the sac. After operation, temperature rose, but there was no complaint of pain or tenderness over abdomen, which became much distended. February 1, temperature rose to 104° F, distention increased, and the patient died. A partial autopsy revealed a water-tight anastomosis, but gangrenous edges of the opposed segments and a spot of gangrene about four inches proximal to the junction. Too much gut had been turned in by suture and the opening at the point of anastomosis was small.

CASE V—*Strangulated Right Inguinal Hernia (Partial Enterocoele), Resection, Murphy Button, Recovery*

W. H., sixty-four years, admitted February 9, 1903, walked in. Three years ago noticed rupture, and procured a truss which held it up well. Two days ago was seized with pain in the right inguinal region, and noticed some swelling in this situation. The pain has been severe, but no nausea or vomiting.

Examination—Just above the right external abdominal ring within the canal there is a small swelling which feels like a cyst, tense, smooth, no impulse on coughing, flat on percussion, not especially tender. Diagnosis not made.

Operation same day. Oblique inguinal incision over mass

revealed a small sac which contained about two drachms of dark-colored fluid, and at the neck there protruded a small, tense, rounded tumor, which proved to be a portion of the wall of the small gut which had become strangulated. The area involved was clearly gangrenous, so the gut was resected and the ends joined by Murphy button in the usual manner. The convalescence was uninterrupted, the patient being fed with great care. There was a very moderate wound infection which was soon over, and the patient was discharged as cured March 8, 1903.

CASE VI—*Strangulated Little's Hernia, Gangrene, Resection of Gut, Anastomosis by the Murphy Button, Recovery*

W H, sixty-four years, admitted to hospital February 9, 1903. Previous history—Right-sided inguinal hernia, noticed ten years ago, but never gave any trouble and always well held up by truss. Ten days ago was seized with sudden pain in the right inguinal region and noticed a swelling there. No nausea or vomiting, bowels have been constipated, but were moved since admission. Examination shows a lean old man in fairly good condition. Heart and lungs negative, arteries slightly thickened. At the right external inguinal ring there is a swelling about the size of a walnut,—tense, smooth, irreducible, flat on percussion, no impulse on coughing. Temperature, 100.2° F, pulse, 72, respiration, 22. Case seen by writer next day, as it was not considered urgent by members of staff who examined it.

Operation—Dr Hotchkiss, February 10, 1903, gas and ether. Usual incision, small sac, dark fluid, and a portion of wall of small intestine protruding into and strangulated by neck. As strangulated portion was gangrenous, gut was resected and ends united by the Murphy button. Uneventful recovery. Discharged as cured, March 3, 1903. The button passed several days later.

In reviewing these six cases, the writer is struck by the lack of uniformity in the symptoms, the absence of any single pathognomonic sign which would have made an early diagnosis reasonably certain, and, finally, by the great disproportion between the severity of the earlier symptoms and the real gravity of the case.

PERFORATION OF THE URINARY BLADDER BY AN APPENDICEAL ABSCESS.

BY I S STONE, M D ,
OF WASHINGTON, D C

MRS T , aged fifty years, had the usual symptoms of appendicitis early in August, 1903 Her condition, in her physician's opinion, was not such as to demand early operation, and she remained in her bed for several weeks at her home in a small country town during her critical illness An abscess developed in the right iliac fossa which caused the usual pain with fever Her bowels were not apparently influenced by the presence of the abscess, nor were the symptoms of peritonitis present

After three weeks' illness the patient had dysuria and other signs of cystitis, which finally culminated in a discharge of nearly a pint of pus (during two days) from the bladder The pain diminished, the fever subsided, and the swelling in the ovarian region began rapidly to disappear The patient was brought to us, October 24, for examination Her condition had greatly improved There was only slight rise of temperature and pulse, and her only complaint was "irritable bladder" and slight tenderness on pressure in the right inguinal region A mass could be located which showed the site of the former abscess, and we suggested appendectomy in order to prevent future trouble

When the abdomen was opened, we found the appendix with a rather fat mesentery adherent over the right upper cornu of the bladder, and stretching across the right side of the pelvis above the Fallopian tube and broad ligament There were no adhesions between peritoneal surfaces except at the point where the appendix and omentum were attached to the pelvic wall as above described The omentum was evidently of great service in securing the attachment of the appendix to the parietes When the appendix was liberated and removed, its distal extremity was found open and in direct contact with the perivesical cellular tissue immediately over the bladder The bladder was filled with an aqueous solution of methylene blue and was found intact, showing that spontaneous closure had been made A drainage tube was

placed outside the peritoneum connecting the infected cellular tissue over the bladder with an incision near the anterior superior spine of the ilium

The patient promptly recovered, and was ready to leave the hospital in two weeks

We have collected reports of over thirty similar cases by as many surgeons, and append the names to this paper for reference

- 1 Fraser, Maritime Medical News, Halifax, Vol xv, No 4, April, 1903
- 2 Fowler, G R Medical News, New York, May 21, 1898
- 3 Keen, W W Journal of American Medical Association, 1898, p 1108
Also American Surgical Association, 1898
- 4 Vanderveer, A Transactions of American Surgical Association, 1899, xvii, 199, Philadelphia
- 5 Stedman, C E Boston Medical and Surgical Journal, September 6, 1888, 241
- 6 Bulkley, L D Montreal Medical Journal (quoted by Costen, also in Universal Annual of Medical Science)
- 7 Coston, H R Memphis Medical Monthly, 1901, Vol xxi
- 8 Allen, Percy British Medical Journal, November 17, 1900, p 1432
- 9 Deaver, J B Journal of American Medical Association, 1901, p 27
- 10 Reynes, H Les Complications Vesicales de la Appendicite, Cong Internat de Med Cr, Paris, 1900, Sect de Chirurg Gen, 685-693
- 11 Duret, H (De Lille) Des Troubles Urinaires dans les Appendicite, L'Assn, Française d'Urologie Prac Verbaux et Mem, 1889, 4
- 12 Lafforge, C Jour de Anatomie
- 13 Gerster, Krackorviser (Medical Record, 1867), Schwartz
- 14 Trommer, I Sulyos Appendicites, Perforational, Budapest, 1901, xli, 602, 604
- 15 Vladoff Thesis, Lyon, Tome xvii, 1897-98, Des Absces Appendiculaire, ouverts dans la Vesie, mentions cases by
- 16 Roux (Lausanne) Med de la Suisse
- 17 Brun La Presse Medicale, July, 1896, p 341
- 18 Poncet (Reported by Brian and Geroud)
- 19 Menere Arch de Med, 1828, p 527
- 20 Leplat (See Vladoff)
- 21 Bulzer Gaz Med, No 25, p 321
- 22 Halle Ann des Surg Genito-Urinaires, 1892, p 916 Recovered
Also, Halle, Ann des Surg Genito-Urinaires, 1892, p 913 Died
- 23 Dauce et Husson Repertoire d'Anatomie, T iv, 1827, Obs 17
- 24 Boiffin Bull Soc de Chirurg (year not named), p 308 (Both rectum and bladder)
- 25 Sedillott Ann de Chirurg, 1841, p 305 (Intest and bladder fist)
Death

- 26 Jackson, James Gazette Medicale, 1837, p 123 (Appendiceal abscess,
perforated bladder) Autopsy
- 27 Roux Lausanne
- 28 Poncet
- 29 Jarville
- 30 Gangolphe
- 31 Rochester, Thomas F Case of Perforation of the Bladder by an Ap-
pendiceal Abscess Trans Amer Med Assn, Vol xxx, 1879, p
495 (Fatal)

OTHER REPORTERS ARE

- Therig Durchbruch in die harnblase Cent fur Innere Medicin Zwei
Falle von Paratyphlitis, Leipzig, 1894, xv, 97-99
- Oesterlen Ueber den Durchbruch perityphlitischer abscesse in die Blase,
und die andern hohlorgans des Beckens, Berlin (Thesis), 1896
- Damien-Masson Étude des complications vesicales dans appendicite,
Paris Thesis Presented November 4, 1898
- Musham, R Mittheilungen aus den Grenzgebieten der Medicin und Chi-
rurgie Jena, 1903, Band xi, p 287

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 28, 1903

The President, LUCIUS W HOTCHKISS, M D, in the Chair

APPENDICOSTOMY, FOR CHRONIC ULCERATIVE COLITIS, ONE YEAR AFTER OPERATION

DR WILLY MEYER thought the members of the Society might be interested in seeing again the patient whom he had shown at the May meeting. The patient was a woman, fifty-four years old, who had had thin bloody stools for over two years before she entered the hospital. According to her history, a diagnosis of dysenteric ulcers was made, although the clinical symptoms also pointed to a specific cause. Upon entering the hospital she was very much reduced in strength, and the electric illumination of the rectum revealed the presence of ulcers throughout this organ, bleeding surfaces were also seen high up at the turn of the rectum. Prior to her admission to the hospital she had been treated at home with irrigations, but without improvement. It was decided to resort to Dr Weir's method of using the appendix for the introduction of an irrigating tube. Through the appendicostomic opening irrigations were kept up every day, then every other day, now for twelve months, the solutions used were silver nitrate in increasing dose, sometimes thymol, etc. When the patient left the hospital, five months after the operation, she had gained over twenty pounds. At the time of her entering the hospital she only weighed eighty-two pounds. On account of strictures within the lumen of the appendix the reintroduction of the tube at intervals had to be given up. She was advised not to make any further attempts to increase her comfort, but to leave the

tube permanently in place The irrigations were given with an ordinary fountain syringe and administered every other day There has been no leakage, and she has continued to gain flesh and strength, now weighing about 110 pounds The rectoscope showed that the ulcers had healed The time has come to remove the tube and let the appendicostomy wound close

APPENDICOSTOMY FOR MULTIPLE PAPILLOMA OF THE COLON

DR WILLY MEYER presented a man, twenty-nine years old, who entered the hospital in May, 1902 He had had repeated hæmorrhages from the intestines, and the rectal tube revealed a number of tumors within the rectum, multiple papilloma A colostomy had been performed on July 10 and 13 according to Schede's method, and on August 20 the rectum was resected with the help of the osteoplastic method of Rehn-Rydygier September showed the wound slowly closing, but a posterior fistula had become established at the place where the sutures had been When the speaker took service a number of ulcerations and recurring papillomata were found in the neighborhood of the internal opening of the fistula The patient asked that the posterior fistula be closed Four months after the first operation, on December 1, the flap was turned back and the partially necrotic piece of the sacrum with the coccyx removed The fistula was found at the site of the suture In order to reach the same, it became necessary to make an additional resection of the sacrum, removing about one-half of an inch of it transversely Then the fistula could be closed with a double row of chromicized catgut sutures after freshening the edges So far as the fistula was concerned the patient did better The discharge was a great deal less, but there was developed retention of urine, which the speaker thought might have been due to some injury to the nerves of the bladder The patient's general condition gradually improved, although he had to be catheterized Eight months later he was able to pass his water all right, and to-day he has complete control

The speaker thought this case illustrated well the wisdom of waiting in such cases before establishing an artificial suprapubic outlet for the urine There had been some trouble with the arti-

ficial anus, and in 1903 one had attempted to close the fistula at its original site after doing an inguinal colostomy lower down. To-day both the colostomy wound and the fistula still lead into the colon. Repeated attempts at closing the latter had failed. When he came on duty again in the hospital during May, the patient was much reduced and had frequent diarrhœa and hæmorrhages. He proposed an appendicostomy, and on the 3d of June it was performed. The appendix was pulled so far out that the entrance to the cæcum corresponded to the peritoneal wound. The abdominal wound having been closed, the appendix projected about one and a half inches over the skin. It was amputated, and probably a little more retained than was necessary. It was permeable. The next day a catheter was introduced and irrigations commenced, using nitrate of silver and thymol, the patient began to improve at once. The irrigations generally took about fifteen or twenty minutes, and the solution was passed during that time, sometimes, however, a few hours later water was still discharged through the artificial anus. To-day the patient had gained much in weight. The catheter was left out from the start.

In an article published some time ago the speaker ventured to propose appendicostomy in cases of intestinal obstruction due to cancer of the colon or rectum. If the appendix was not found to be obliterated, it certainly was simpler and safer to do appendicostomy than cæcostomy. He had tried to find out in this patient whether water would return through the tube after the colon had been distended. For this purpose the afferent part of the artificial anus was tamponed, and now a large quantity of water allowed to flow in. It was noted that only a small amount of water returned. This was perhaps due to a papilloma obstructing the inner end of the tube. Only observations on cases as mentioned above will clear up this point. Dr Meyer expressed the opinion that, according to his experience, appendicostomy had a decided place in the field of surgery.

DR HOWARD LILIENTHAL said he had had three cases of appendicostomy, one had been reported some time ago and was a failure, the other two were successes. In both of these latter cases there had been no difficulty in irrigating with the rectal tube introduced not far and with the catheter in the appendicostomy wound. The fluids used came through promptly. His second

successful case was operated upon by one of his adjunct surgeons. This patient gained twenty pounds in a short time in spite of the fact that there was a nephritis at the time of operation. Both these cases were ulcerative colitis. The unsuccessful case was one of papillomatous colitis, the fluids would not run as they should, and finally a cæcostomy was performed. This patient went from bad to worse and died of asthenia.

He did not believe that in old persons with stricture of the lower bowel such an operation would ever become valuable, especially when the needs of operation and relief were urgent. He believed one took chances in not working quickly, *i e*, doing a quick colostomy and relieving the imminent danger. More radical procedures could then be later undertaken.

CHOLECYSTECTOMY

DR WILLY MEYER presented a woman, fifty-two years old, who had entered the hospital the middle of last December with symptoms of a first attack of cholecystitis. All the symptoms were but slightly developed, and there seemed to be no reason to fear the existence of any serious trouble. After entering the hospital all clinical symptoms soon subsided except some slight tenderness over the region of the gall-bladder. An operation was advised and performed with a longitudinal incision through the rectum on the 27th of December, when the following conditions were found. The omentum was adherent to the gall-bladder and liver, after stripping it off an abscess was found which contained about an ounce of pus. The speaker was surprised to find underneath the omentum the existence of a pretty far advanced gangrene. Nothing could be done except to extirpate the gall-bladder, which was done in the usual manner. He used silk for tying the cystic duct, now he uses chromicized catgut. The mucous membrane of the removed gall-bladder was found to be diffusely gangrenous. The specimen which he presented showed an artificially inverted, much thickened gall-bladder, with the scattered necrotic patches of the mucosa still visible. One very large stone was found with one facet, and on top of it a smaller stone was found with two distinct facets, one on either side. It was interesting to note that the smaller stone had made a complete somersault within the bladder. This moving of the stone

probably has occurred at the time the gall was flowing into and out of the bladder, allowing the small stone to turn and to rub at one time his one pole on the larger stone, and at another time its other side. There surely had been only two stones in the bladder.

The silk ligature was used on the 27th of December, in the beginning of February, six weeks later, he succeeded in removing the thread. The patient was now perfectly well. No ventral hernia had developed.

DR GEORGE WOOLSEY reported the case of a woman in the Presbyterian Hospital upon whom he had operated last summer. The symptoms, so far as the tenderness and pain were concerned, were confined to the left side. These symptoms were referred to a point to the left of the median line, about three inches above the level of the umbilicus. There was no pain or tenderness on pressure between the umbilicus and margin of the ribs on the right side. A probable diagnosis of cholelithiasis was made, although there arose the question of disease of the pancreas. The history dated back five or six years, and the symptoms were increasing in severity. The patient had a slight temperature, 101° F, and slight jaundice. An incision was made in the median line and nothing was found on the left side. The gall-bladder was small, and did not project below the margin of the liver. Its layers were thickened and very dark, almost gangrenous, in appearance. The gall-bladder contained many stones, half a dozen of which were quite large ones. He searched for a possible cause of the jaundice, but no stone was found in the common duct, the head of the pancreas was found to be enlarged and hard. The jaundice he attributed to slight obstruction due to pressure of the hard pancreas upon the common duct. The gall-bladder was removed by a simple cholecystectomy, with good results. The jaundice gradually disappeared. The interesting and unusual feature was the tenderness on pressure and pain confined to the left side. The explanation of this was obscure. Whether it was due to adhesions, which presented nothing unusual, to the pancreatitis, or to some other cause, he could not say.

DR WILLY MEYER said that he too had noticed in several patients who were troubled with a chronic recurring cholecystitis that they complained of tenderness on the left side of the lower abdomen in the acute attacks and of more pain on the left than

on the right side. He believed the general practitioner was sometimes misled in his diagnosis on account of this peculiar condition. He was inclined to explain this peculiar phenomenon as being due to irradiation within the affected sympathetic nervous system.

ŒSOPHAGEAL STRICTURE DILATED BY A THREAD AND RUBBER TUBE

DR CHARLES N DOWD presented a child of four years who was admitted to St Mary's Hospital for Children, March 28, 1903, for pneumonia and œsophageal stricture. About February 15 she had swallowed some lye, and had suffered from increasing difficulty in swallowing for the last three weeks. The pneumonia, which was severe, prevented treatment of the œsophageal stricture at first, but by April 6 the pneumonia had fortunately subsided enough to permit a gastrostomy. At this time the child's condition was most pitiable. She was emaciated to the last degree, and was as nearly starved as a child could be and yet live, apparently nothing had passed from the mouth to the stomach for several days, and rectal feeding was a poor substitute for normal feeding during an exhausting illness. It was doubtful whether she could endure anæsthesia and even a mild operation, but fortunately she did, and gastrostomy was done by the purse-string method (Stamm's), and milk was introduced into the stomach while she was still on the operating table. After this she gained very rapidly, there was no leakage from the gastrostomy wound, she consumed large quantities of milk, and gained much in weight and strength.

The stricture still remained, however, no instrument could be passed from above, and repeated efforts to float a silk thread through, as advocated by Dunham, were fruitless. Therefore on May 1 an attempt was made to pass instruments upward through the cardiac orifice of the stomach, the gastrostomy opening was enlarged sufficiently to admit a Kelly's cystoscope tube, one-half inch in diameter, and by means of reflected light the orifice was found, but nothing could be passed. A large blunt-pointed copper probe was tried, then a small blunt-pointed silver probe, then filiforms and various kinds of bougies, but all of them met firm obstruction close to the stomach mucous membrane. In order to test the permeability of the stricture, a little milk was then

passed in from above through a catheter, and after a time a minute drop came through the opening, but the probe failed to pass when applied to this very spot. The child was therefore put back to bed and a second similar attempt was made three days later, but that too failed. No further attempts were made to pass instruments from below, but renewed efforts were made to pass a thread from above by running it through a drinking-tube, holding it so as to prevent too much going in at once, and then waiting for the free end to be carried through the stricture with the feeble flow of the water which worked its way through the stricture. Dr J H Lewis, the house surgeon, was most patient and persistent in this work, and finally, on May 13, succeeded in getting a fine silk thread through from the mouth to the stomach. The dilatation of the stricture was then simply a matter of time and patience, other threads were drawn through on this one, and on May 15 one of them was drawn up and down so as to slightly saw the stricture walls, following Abbe's suggestion (*N Y Med Record*, Feb 25, 1893), and a piece of rubber tubing about the size of a No 15 French catheter was stretched out by a thread attached to each end, drawn into the stricture and permitted to remain in place and dilate it by its elasticity, as advocated by Dr Curtis before this Society (see *ANNALS OF SURGERY*, Vol xxxi, p 352). This tube slipped into the stomach, and on May 20 was removed, and an unsuccessful effort was made to pass bougies from the mouth, they only went to a point seven inches from the teeth, however. On May 22 another larger tube was stretched and drawn into the stricture, and four days later this was drawn up through the mouth, but even then bougies could not be passed from above. On May 27 she was able to take milk and soft hominy porridge by the mouth, and the next day she took crackers and bread and milk.

May 29 a No 15 (F) bougie was passed upward by inserting its tip in the end of a No 12 catheter, which was drawn upward on one of the threads. By pursuing this method only a No 16 bougie could be passed from below, June 11, and none could be passed from above. On that day a No 19 wire bougie (Dunham) could not be drawn through the stricture. A piece of rubber tubing the size of a 32 French catheter was therefore stretched and drawn into the stricture, on the following day this had slipped into the stomach, and a No 24 bougie could be

passed from above. The bougies were then passed daily, and by July 17 a No. 28 was passed into the stomach from above. Bougies have been passed since at irregular intervals, and now size No. 26 passes easily into the stomach, and she takes the ordinary kinds of solid food and swallows and digests them well.

There are several points of interest in this case. The most important is the passage of the silk thread through the stricture after the failure of most careful and persistent efforts to pass instruments both from above and below. The stricture occupied the lower three inches of the œsophagus, and was so tight as to hardly have a lumen. When the child took fluid by the mouth, she swallowed a little, and then regurgitated it, throwing up, as nearly as could be measured, all that she had taken, and when the process was observed by introducing milk into the œsophagus through a catheter, and then watching for several minutes at the cardiac orifice through a cystoscope tube with the aid of reflected light, so small an amount of milk trickled through that it could hardly be called a drop. Yet the thread finally found its way through this minute channel, a remarkable illustration of the efficacy of this simple procedure so ably proposed by Dr Dunham (*ANNALS OF SURGERY*, March, 1903, p. 350). This method is apparently the best that we have for introducing a guide through a very narrow œsophageal stricture. The case, too, illustrates the efficacy of the stretched rubber tube as an œsophageal dilator. It was surprising how easily the tube could be introduced, and how quickly it dilated the stricture when in place. After drawing the thread up and down a few times, the first size, No. 15 French, was easily introduced, and probably fell back into the stomach on the following day. The second size, No. 20 French, was also easily introduced, and was held in place by fastening the string to the cheek, this, however, caused much irritation. The third size, No. 32 French, was also easily introduced, and was only left in place one day, but in that time it dilated the stricture from sixteen to twenty-four, as measured by bougies. No doubt the entire dilatation could have been accomplished within a very few days, or perhaps at a single operation. With this weak child, however, it seemed better to use a more gradual method.

There was enough leaking from the gastrostomy wound to make a troublesome complication in this case. After the enlarge-

ment of this wound for the introduction of the cystoscope tube and passage of instruments, purse-string and interrupted sutures were taken to constrict the opening, but as there were no fresh peritoneal surfaces, they did not prevent leaking entirely, and it hardly seemed wise to expose the peritoneal surfaces anew, since healing was taking place without it. The wound has now been practically healed for weeks, although there is still a very little leaking from a minute opening.

THROMBOSIS OF LATERAL SINUS AND UPPER JUGULAR VEIN

DR. CHARLES N. DOWD presented a girl of eleven years who had been suffering from a discharge from the left ear for over a year. Six months ago it became worse, for the last month she had suffered from increasing pain, and on September 12, two days before her admission to St. Mary's Hospital, she had a chill. When admitted, there was moderate tenderness over the mastoid, and soon afterwards she had a chill, and her temperature went up to 105.2° F. On the following morning he operated, and found extensive disease of the mastoid. There was considerable pus in the antrum and the bony structure behind and below it. It was an extensive case of suppurative mastoid disease, and a thorough mastoid operation was done, all the pneumatic cells being removed, and drainage established from the tympanum through the antrum. There was one spot of bone over the lateral sinus that looked suspicious, and it was removed, the sinus was inspected and found to be normal in appearance. After the operation the temperature went down, and remained so for one week, all the symptoms being favorable, then it suddenly went up again, the patient had a chill, then another and another, the temperature going to 105° F, and over the upper part of the jugular vein there was some swelling and tenderness.

Another operation was therefore done. On removing the bone from over the lateral sinus much inflammatory exudate was found, and hence, before proceeding further there, an incision was made in the neck and the internal jugular vein was removed from just above the clavicle to a point above the entrance of the facial vein. The vein above this point was shrunk and its lumen obliterated. The longitudinal sinus was then exposed from

the bulb backward for about an inch and a half, and was found to be obliterated throughout this area, its shrunken walls and the adjoining dura showing a plastic exudate which indicated the extent of the inflammation. Since no clot could be turned out here, and since the infection which had caused the recent chills had apparently come from the upper jugular, further exploration seemed inadvisable, and accordingly the wound was packed and the dressing applied. There has been no return of the chills and no further evidences of either septicæmia or pyæmia, and the patient has progressed steadily towards recovery, the wound now being nearly healed.

DR WILLY MEYER had had two cases of thrombosis of the internal jugular in which an operation had been previously done and the sinus exposed by an aural surgeon on account of conditions similar to the one reported by Dr Dowd. In one case he had ligated the jugular vein just above the clavicle, and, in the other, the vein was so thoroughly thrombosed far down towards its entrance into the subclavian that he decided not to attempt to loosen it. In both cases the vein was not extirpated, but slit open in its entire length. In the first case irrigations could be made through the temporal bone and the fluid made to appear in the sinus, in the other case this could not be done. Both cases made good recoveries.

TUBERCULAR OSTEOMYELITIS OF THE TIBIA

DR CHARLES N DOWD presented a child two years old who was in good health until the middle of April, when his mother noticed that he complained of tenderness over the middle of the left leg. At that time no swelling was apparent, and there was no history of injury. A slight swelling, however, soon appeared, and increased very slowly until his admission to St Mary's Hospital, July 20. At that time it was about an inch and a half in diameter, was hard, and tender on pressure, it was on the anterior surface of the left tibia about its middle, the skin was freely movable over it, and there were no signs of acute inflammation. The bone, both above and below this point, seemed slightly thickened, his temperature was 100.5° F, pulse, 120, respiration, 24. Operation was done July 24, and there was found to be an involucrum about the entire tibia, which at the point of great-

est swelling was one-half an inch thick, and over the rest of the bone was about one-eighth of an inch thick, this was removed over the entire anterior surface of the bone, which looked hard and almost normal, but on cutting through a spot which seemed a little softer than the rest, the entire bone cavity was found to show evidence of extensive rarefying osteitis, it was roughened, there were small sequestra, and the bone in many places was destroyed almost to the surface. All of the bone and involucrum between the two epiphyses was removed, excepting a small strip which was just sufficient to maintain the shape of the leg with the aid of splints and the fibula. The cavity was washed out with bichloride of mercury solution, 1 to 5000, and the periosteum and skin were sewed together with catgut, and a wet dressing applied.

The wound healed up promptly by primary union without incident. The accompanying photograph was taken fifteen days after the operation. The child has remained well ever since excepting for bronchitis for which he is now being treated in the hospital. There is still very slight tenderness about the tibia.

The Pathological Report, which was made by Dr Mathews, the hospital pathologist, was as follows:

Periosteum and medulla of tibial shaft

Small masses of tissue

1 Periosteum. The tissue shows production of periosteal bone and thickening of periosteum. It also shows discrete typical tuberculous lesions, *i e*, miliary tubercles with central necrosis and periphery of giant and epithelioid cells.

2 Medulla shows lesions of diffuse tubercle. No microscopic evidences of suppurative inflammation.

Culture smears on blood serum (Loeffler) remained sterile in thermostat.

Tubercular osteomyelitis of the large long bones is certainly among the rarer inflammations, the tubercular processes usually being confined to the epiphyses and to the tissues adjacent. It is mentioned by various authors, but is uncommon enough to warrant the presentation of this case to the Society. The entire history of the disease and the appearance at operation were those of subacute osteomyelitis, and the general disease of the medulla, the formation of sequestra and of involucrum, corresponded to that disease. The satisfactory healing by primary union is also



Tubercular osteomyelitis of tibia fifteen days after operation

noteworthy in so extensive a bone lesion, and it emphasizes the desirability of attempting to gain such healing in the subacute cases. The strip of bone left was not strong enough to fasten nails to, according to Neuber's method, if one had been so disposed, and the spots of local inflammation which would have been thus closed would have been disadvantageous.

CHOLECYSTECTOMY

DR HOWARD LILIENTHAL presented a man, twenty-six years old, who had been admitted to the hospital March 14, 1903. He had had measles and rheumatism, but no typhoid fever. He had no jaundice. He had had hæmorrhoids for two years. During the past two years he had had several attacks of what apparently was biliary colic. He had never passed any stones, although stones had been looked for. The attack for which he came to the hospital had lasted seven days. He had cramps in the epigastrium. He had vomiting and, two days after, pain and chills. The next day his vomiting continued. For four days he was constipated. The pain was constant until two days before admission, when it began to diminish, it continued to be localized in the epigastrium. On admission, the patient had a temperature of 101° F and no jaundice. The local and physical signs showed tenderness and rigidity in the right hypochondrium, the tenderness being one and a half inches above and to the right of the umbilicus. He was operated upon on the 17th of March. Three-inch rectus incision. The gall-bladder was removed after separating omental adhesions. It was about six inches in length, had thick walls, was full of pus, and contained eight stones. Ulcerations and gangrenous areas were present. The specimen was presented. The stones were fairly large. A few days afterwards he had hypostasis at bases of both lungs. He did not incise the common duct because there were no signs of general obstruction and so he saw no reason for so doing. Chromic catgut was used to ligate the cystic duct. By April 8 the wound had healed nicely, and the patient had had no trouble since with his gall-bladder.

PYLOROPLASTY, GASTROJEJUNOSTOMY

DR JOHN ROGERS, JR., reported the case of a man, fifty-six years old, whom he had seen in December, 1902, with a dyspepsia

which had been of about twenty years' duration Examination revealed a dilated stomach and palpation showed a possible tumor in the region of the pylorus The patient had all the symptoms of a pyloric obstruction, and a tentative diagnosis of cancer was made, as the symptoms had become recently very much exaggerated An incision was made in the right rectus muscle, and the findings were simply those of a thickened pylorus The patient took ether very badly, and all attempt at pylorotomy was changed to hasty pyloroplasty The pyloroplasty opening was large enough to admit of two fingers The patient was all right until August last, when symptoms of obstruction again appeared This showed the failure of the pyloroplasty operation, although the conditions for a success were good On October 5 he did a gastrojejunostomy by a method which is used in many of the clinics abroad, but receives rare mention in this country It consisted in a retrocolica posterior operation The opening in the stomach was placed on the posterior surface near the greater curvature and in the jejunum within three inches of its origin The jejunum was then sutured in the natural vertical position (which is its course in this part) to the posterior wall of the stomach On October 15, ten days later, the patient returned to his shop No disagreeable symptoms followed the procedure This form of gastroenterostomy seemed to him to be a very useful method, and one that was not enough used in this country

DR ELLSWORTH ELIOT, JR, asked what was the condition of the stomach at the time of the second operation He recalled a case in which all the symptoms of cancer of the pylorus were present This patient was a woman aged forty years, and three years and a half ago, at the time of operation, he had found the pylorus to be the seat of a growth which was hard and nodular and had all the landmarks of cancer As the general condition of the patient was such that no prolonged operation could be withstood, a posterior gastro-enterostomy with the Murphy button was done, and the abdominal wound closed At the end of three or four months this patient had gained forty or fifty pounds in weight She was then advised to submit to another operation for the removal of the tumor, and her consent was obtained Upon opening the abdominal cavity no trace of the tumor could be found The patient since then has continued to enjoy good health, without any symptoms of pyloric stenosis or evidences of any growth

The Murphy button has never been passed, and the X-ray showed it still to be in the stomach. He had read of cases in which, at the original operation, the pylorus was resected for carcinoma, and in which a subsequent microscopical examination failed to detect the disease. The resemblance to carcinoma was in these cases believed to be due to a peculiar pyloric muscular contraction which resulted in a consistency which simulated the hard-like character of cancer. In the present instance, however, the growth noticed at the time of the original operation must have been the cicatrix of some prior extensive ulceration, and its disappearance must have been due to the removal of the irritation by the gastro-enterostomy.

DR F KAMMERER said that inflammatory tumors in the region of the pylorus simulating carcinoma were not so very rare. They frequently disappeared after gastro-enterostomy. In one of two such cases which he had observed a secondary laparotomy, some six or eight weeks after the operation of gastro-enterostomy undertaken with the idea of removal of the growth, showed that the tumor had entirely disappeared. The case had been demonstrated at one of the Society meetings several years ago, and he would not enter further upon its history.

DR HOWARD LILIENTHAL said he had had three cases in which he had done the Finney operation, and he wished to speak in favor of it. The anastomosis will not contract. If the pyloroplasty opening remains at all patent, there was a strong probability that a coexisting Murphy button gastro-enterostomy would close. When Finney read his paper before the Society, he showed a stomach in which this had taken place. The Murphy button wound had closed, so that only a fine bristle could be passed.

DR. JOHN ROGERS, JR., said that the condition of the stomach in the first operation showed such a thickening of the pylorus that it simulated a cancer at that situation. Upon further examinations it was shown to be hard, but it did not cut like a cancer, and, therefore, he did not attempt to do more than a Heinecke-Mikulicz operation, making the incision through the under part of the pylorus and adjoining portions of the greater curvature of the stomach and first portion of the duodenum. It thus approached a Finney operation. At the second operation the thickening and hardness had disappeared from the pylorus. The finger was passed through the pylorus, and it was demonstrated that the

pyloroplasty had failed from cicatricial contraction. It had shrunk from a size admitting two fingers at the original operation in the previous December to a barely perceptible aperture.

CONTUSION OF ABDOMEN, RUPTURE OF THE SMALL INTESTINE, ENTERORRHAPHY

DR L. W. HOTCHKISS presented a man, twenty-one years of age, who was admitted to Roosevelt Hospital, September 2, 1903, with the history that while helping some other workmen to lift a heavy fire-shovel the patient received a powerful blow in the abdomen from the handle. He experienced immediately intense abdominal pain and began to vomit. He was brought to the hospital shortly afterwards by the ambulance. At the time of admission his condition was fairly good, there was very little or no shock, but he complained of great pain in the abdomen, and lay in bed with his limbs drawn up. There was well-marked rigidity, especially over the right side of the abdomen, and tenderness, with no evidence of any lesion of abdominal wall to account for it. His pulse was 80, respiration, 28, and entirely thoracic, and his temperature, 99.6° F. He was seen by Dr. Hotchkiss shortly after his injury, and, in view of the well-marked local rigidity, the great pain and vomiting, immediate operation seemed indicated in view of a possible intestinal rupture. The patient was prepared at once for operation and brought to the operating room a little less than an hour from the time of admission. Under gas and ether anæsthesia a laparotomy was performed, the incision separating the outer fibres of the right rectus muscle for about two inches above and below the level of the umbilicus. Gas, fluid, and some intestinal contents escaped on incising the peritoneum, and, after washing with saline solution, the coils of small intestines lying near incision on the right side of the abdominal cavity were examined. A rupture through all the coats of the jejunum was quickly found, isolated, and closed with fine silk sutures after Connell's method, the lower end of the tear being closed by a Lembert suture only, and the suture line fortified by one or two others. The tear involved nearly one-half of the circumference of the intestine, and extended from the mesenteric nearly to the free border in a direction at a right angle to the long axis of the gut. After thorough flushing of the peritoneal

cavity with warm saline solution, the abdominal wound was closed without drainage, and the patient returned to bed in very fair condition. The subsequent history of the case was uneventful. Vomiting occurred only once after the operation, and some slight colicky pains the first two days. There was some elevation of temperature, but no wound infection, and the healing was prompt and satisfactory. Rectal feeding was kept up for about ten days, and after this a gradual resumption of ordinary diet. The patient was discharged well on September 24.

The principal features of interest in the case are the character of the injury, the symptoms, rigidity, and continued vomiting, the early operation, and the efficiency of the Connell suture.

The case showed the value of sudden marked rigidity of the abdominal wall as an indication of rupture of the intestine. Although this is by no means pathognomonic, it is always suggestive in cases of this sort, and, taken in connection with the nature and situation of the injury, often justifies an exploratory incision.

HARELIP AND CLEFT PALATE

DR A. L. FISK read a paper with the above title.

DR GEORGE WOOLSEY, in referring to the mortality from *maiusmus*, said that the different results that were obtained in private and in hospital practice were very striking. He knew of one hospital surgeon who had given up operating for harelip in hospital practice on account of the bad results obtained. It must be remembered that the general condition of the harelip cases admitted to the hospital was bad.

Regarding the time for operation, he thought it was the wisest plan to wait until such a time when the tissues were strong enough to bear the sutures, so that they would not readily pull out. Again, he thought we should wait until the baby was old enough to stand the hæmorrhage. Very young babies do not stand bleeding well. He preferred to wait until after the second month.

With regard to cleft palate, it is certainly easier to wait until the child is four or five years old, when the mouth is larger. Especially since the appearance of Wolf's and Brophy's papers the tendency was to operate earlier. He had done Brophy's

operation in only one case, but he was not impressed with it. In this operation the patient must be very young, because then it was easier to bring the cleft together by twisting the wires.

DR CHARLES N DOWD said that there was one element in the method advocated by Brophy which he had considered with much interest, viz, the bringing down of mucous membrane from above the edge of the cleft, and hence avoiding the lateral cuts which are so often made. Brophy had specially devised periosteal elevators for this purpose, and used the method in children whose first teeth had appeared when the bones could not well be crushed together. The flap of periosteum and mucous membrane which was brought down was wider than that obtained when the edges of the cleft were denuded by cutting, but the tissue which was brought down from above the cleft was very thin in the two cases in whom he had tried the method. There was, however, a decided gain in the width of the flap.

DR WILLY MEYER said that he did not advocate operating upon such cases before the end of the third month. He emphasized the importance of having the babies properly trained in using the feeding-bottles. The rubber nipples had to be so arranged that, when pressed by the lips, the milk would squirt out into the child's mouth.

Stated Meeting, November 11, 1903

The Vice-President, HOWARD LILIENTHAL, M D, in the Chair

TENORRHAPHY

DR BERN B GALLAUDET presented a man who was injured a year ago by an explosion of gas. Four of the extensor tendons of his left hand, including the extensor longus pollicis and brevis, were cut. Considerable retraction had occurred, and some difficulty was experienced in bringing together the ends of the divided tendons. The radial nerve had also been cut, and after uniting the tendons this was anchored into the fascia by means of a fine

catgut suture The wound was closed and the hand put up in a position of hyperextension Primary union occurred throughout, with the exception of a small area over the tendon of the extensor longus pollicis, where there was slight sloughing The resulting sinus closed in about two months

At the time of the accident there was marked numbness over the region of the radial nerve this had practically disappeared

CASE OF EXCISION OF KNEE FOR FLEXURE ANKYLOSIS

DR F TILDEN BROWN presented C K, male, aged fifteen years, a native of the United States, who came under observation in June, 1902, with a right-angled flexure of the left knee Despite the wearing of a high-heeled shoe, he walked in a crab-like fashion, the sound leg being kept voluntarily bent in order to help compensate for its flexed and ankylosed mate

There was no family tuberculous taint, and the patient's history and present condition gave no evidence of any tuberculous foci, except in regard to this left knee

When eighteen months old he fell out of an overturned baby carriage Two months later there was a swelling of the left knee, which was opened in the popliteal region Some two months later he was received at one of the hospitals in New York, and there treated for two years by an extension apparatus, and for an abscess in and about the knee When the boy left the hospital, at the age of four and one-half years, his knee, although ankylosed, is said to have been but little bent, and he continued to wear a brace for three years, despite which flexure was gradually increasing When examined, the boy was found fairly well nourished The lower end of the sternum was somewhat prominent as in pigeon breast Heart, lungs, liver, and spleen gave the physical signs of normal organs The left knee presented an ankylosed flexure of eighty-five degrees Numerous transverse and vertical scars were about the joint, and the length of the knee showed striking evidence of the abnormal epiphyseal growth As the boy and his mother desired a surgical correction, a cuneiform excision of the knee was made on August 26, 1902, at the Presbyterian Hospital, under gas and ether anæsthesia

A transverse incision was made from the outer to the inner condyle, tissues and periosteum reflected; wedge-shaped piece

of the femur and tibia, three and one-fourth inches wide at its base, was removed by saw. On straightening the leg it was found necessary to remove small similar sections, with a total additional base of one and five-eighths inches, to obviate bony interference with full extension. And now, although the bony hiatus was large enough not to prevent full extension, nevertheless the hamstring tendons and bound-down popliteal vessels were the cause of limitation, permitting only of about 170 degrees of extension. Bony, periosteal, and cutaneous tissues were separately sutured. During this procedure, as well as the application of plaster-of-Paris splint, forcible extension was exerted. On reaching his bed the boy was put in a Volkman sliding extension splint with weights, and so retained for a month. Primary union, and convalescence was uneventful. He was discharged seven weeks from the time of operation, still wearing a well-fitting plaster-of-Paris splint. For a week before discharge he had been permitted to use the leg a little in walking, braced, of course, by the splint, despite the precautions, there seemed to be a slight evidence of a recurring flexure. At this juncture he was fortunately able to elicit Dr W R Townsend's interest in the case, and by his personal oversight in the matter of various braces, which have been worn now for over a year, the leg is even straighter to-night than when he left the hospital.

In view of the great difficulty met at the time of operation to extend the leg more than to 170 degrees even after the removal of a bony triangle, the anterior face of which was more than five inches,—and this limitation being recognized as due to tension of the flexor tendons and popliteal vessels,—it is not easy to understand how works on orthopædic surgery advocate the correction of such ankylosed deformities by forcible flexion and extension without any cutting other than a previous tenotomy. It seems certain that the popliteal artery could not have escaped rupture in this particular case had such a practice been here attempted, for the old popliteal cicatrices had bound the artery so firmly to the adjacent tissues as to give it a dangerous tension on closing the hinge after the general generous excision here done.

DR W R TOWNSEND has kindly contributed the accompanying notes to Dr Brown's case.

C K came to the Out-Patient Department of the Hospital for Ruptured and Crippled, October 15, 1902, with a flexion



Ankylosis of the knee in flexion — corrected by excision

deformity of nearly twenty degrees following an excision of the knee. As this patient had suffered the removal of so much bone at the time of operation, it was not deemed advisable to do another excision or osteotomy, but to treat him by means of a Thomas knee-brace, with extension straps, applied to go inside of the leg-bars and fasten to the footpiece. Direct traction was thus made on the tibia and fibula and counter-traction made by the ring passing around the upper end of the thigh. The limb was thus gradually pulled down and, as the boy grew, straightened. This method is particularly applicable to cases where, after excision, there is a little deformity remaining, and the bony union between the excised fragments is not perfect.

The necessity for after-care in these cases is very great, and the number of patients who apply at the Hospital for Ruptured and Crippled suffering from relapses after excisions is quite large, the most common deformity being the flexion. In this instance the flexion was not a relapse, because the limb had to be placed in flexion, and to have removed any more bone would not have been proper, and would have sacrificed very materially the growth of the leg, and to forcibly straighten it might have caused serious damage by rupture of the popliteal vessels.

DR ROYAL WHITMAN said that in childhood a stiff knee would almost invariably become flexed unless it was protected. He thought in such cases, in the younger class, it would be unfortunate if one were obliged to resort to a cuneiform excision which would remove the epiphyseal cartilages in whole or part. Except in extreme case, if the deformity could not be overcome by correction within the joint, he would favor simple osteotomy of the femur just above it. In many instances preliminary division of the hamstrings might be required, and it was often advisable to straighten the limb at several sittings, allowing intervals for the adjustment of its circulation to the new conditions.

CASE OF TRAUMATIC HERNIA, PRIMARY STRANGULATED INGUINAL HERNIA SYNCHRONOUS WITH EXTERNAL VIOLENCE

DR F TILDEN BROWN presented J B, male, eighteen years, groom. On the morning of April 9, 1902, being called to an accident case at the Riding Club I found the patient lying

on his side, his legs drawn up and his hands pressed over the lower left part of his belly. Attitude and facies were both corroborative of the pain of which he complained, most in the left inguinal but to some extent in the umbilical region. Pallor of face and perspiring forehead accompanied nausea, but he had not vomited for nearly half an hour before. While riding, the horse reared and fell backward upon him. He immediately felt a pain in the left groin and could not stand upright. On handling himself, he discovered at the place of greatest pain a small lump on the left side of his scrotum, which had never been there before.

Examination confirmed this observation, and showed a very tense and quite tender tumor of hickory-nut size just below the left external ring. Both testes were of normal size and at the lower part of the scrotum.

Placing the patient in a moderate inverted posture on cushions, with flexed thighs, after two or three minutes of forceful and even taxis, somewhat sudden reduction of the tumor was effected, attended with an immediate relief of the severe pain. Compression bandage was applied, and the patient removed to his home. He remained in bed eight or nine days, having some tenderness in the left inguinal region and a moderate ecchymosis of the left side of scrotum. The external ring and canal were not larger than normal, and in fact not seemingly as large as they were on the right side. The patient had never had any previous symptoms suggestive of an incipient rupture. He had been a jockey and riding groom since he was a small boy, and wishing to be in the best state to continue this avocation, he asked for a radical operation, for which he entered the Presbyterian Hospital thirteen days after the accident. Examination at this time failed to discover any evidence of a hernia, straining and coughing could effect no protrusion even into the canal. His abdominal walls were firm, and the sensation imparted over each internal ring to the examining finger was the same. Operation on April 22. Gas and ether anæsthesia. At the uppermost part of the opened inguinal canal a small pouch was found and opened. Adherent to its inner surface was a quill-size extension of omentum which was easily freed. A purse-string catgut suture was carried through the base of the pouch. The wound and

cord were treated after Bassini's method, with chromicized cat-gut Bowels moved the third day. Uneventful convalescence. Primary union, and discharged on May 15

Finding this very short sac with adherent omentum was proof enough that rupture existed, and while the exact date of its inception must remain undetermined, there is no question but that the direct exciting cause of its first appearance and sudden strangulated protrusion were violent compression of the parietes. It seems strange that such a combination of circumstances, causative of rupture, should be so rare. In Coley's report of a thousand operative cases, none presented a similar history of onset. In Bull and Coley's article in Dennis's "System of Surgery," in allusion to causation of hernia, it is stated that "in a few well-authenticated cases a pronounced hernia has immediately followed a sudden strain when absolutely no sign of a hernia had existed previously. In a few of these cases strangulation has occurred synchronously with the first appearance. Such cases are very rare, but should be borne in mind." The authors cite two cases seen at the New York Hospital during seven years, where the occurrence of a strangulated inguinal hernia had been sudden and without premonitory symptoms, unless the existence in one case of an undescended testis might be classed as such. In neither case was there any abdominal compression, nor could any unusual muscular exertion be cited as an etiological factor. The same article mentions that one somewhat similar case involving the femoral region had been observed at the Hospital for Ruptured and Crippled. The mechanism of the hernia in the case shown would seem to be adequately explained by the elastic compression theory, where, if any had previously existed, it was but a shallow sac that had never before reached nearly to the external ring. A sudden and unusual intra-abdominal pressure exerted by an outside force expressed a loop or lateral wall of bowel with force enough to protrude it through and beyond the external ring, where it was held by the constricting arch of the dense elastic fibres of the aponeurosis of the external oblique until overcome by taxis.

DR WILLIAM B COLEY regarded Dr Brown's case as one of the most remarkable cases of hernia that had ever been presented to the Society. The speaker said he had recently had occasion to look up the subject of traumatic hernia, and in reviewing

the history of over 50,000 cases observed at the Hospital for Ruptured and Crippled he had found not more than four in which there was a probability that direct traumatism was the cause of the rupture, and even in these four the proof was not absolute. One of the cases was that of a man who had been operated on by Dr. Coley for an inguinal hernia. The operation had been done two or three years ago, and a recent examination had shown no signs of a recurrence. A few days later the man was kicked directly over the scar, and immediately afterwards the hernia reappeared. In two of the other cases the hernia apparently developed after a kick, and in the fourth it appeared after the patient was thrown against a hard object. In the two cases in which the hernia followed a kick, there was no history of a previous examination, and the hernia might have existed prior to the accident. That possibility should always be borne in mind. It is not uncommon that a patient who comes for treatment of a hernia on one side is found to have one on the other side which he had never discovered, and in such a case, given an accident, its presence might easily be attributed to a traumatism. Dr. Brown's case seemed to fulfil the requirements of a hernia due to direct violence better than any he had ever seen or heard of. Two authentic cases had been reported in Germany, one by Belfinger and the other from Von Hacker's clinic.

STRANGULATED INGUINAL AND PROPERITONEAL HERNIA

DR. GEORGE E. BREWER presented a negro, aged thirty-eight years, who was admitted to the Roosevelt Hospital in August, 1903. He had suffered from a left oblique inguinal hernia for a number of years, which was usually well retained by a suitable truss. On several occasions during the last four years, in the absence of his truss, a protrusion of the hernia had occurred, which had become temporarily incarcerated, giving rise to pain, vomiting, and moderate prostration. These attacks, however, had generally been relieved by rest and taxis.

When admitted to the hospital there was an oblong tumor, about the size of a closed fist, occupying the inguinal region and upper part of the scrotum. This was markedly tender to pressure.

The patient had been vomiting for about twenty hours, and complained of severe pain in the lower abdomen. He was immediately prepared for operation, and under ether anæsthesia taxis was attempted for a few minutes, but without success. An incision was made over the tumor and the various layers of tissue divided until the sac was reached and opened. Within the sac, which was apparently divided into two compartments by constricting bands, there was found about four inches of dark-colored intestine and a small amount of bloody serum. When the constriction was relieved, the intestine slowly regained its normal color and was easily reduced. When about to close and remove the sac, preparatory to performing the Bassini operation for the radical cure, the finger was introduced, presumably into the peritoneal cavity, and though the intestines were distinctly felt, and the walls were apparently lined with smooth peritoneum, the cavity appeared decidedly restricted.

A wide incision was then made through the internal oblique and transversalis muscles, and a large coil of small intestine found in a third upper compartment of the hernial sac, which occupied a position between the parietal peritoneum and the muscular wall. The properitoneal sac communicated with the general peritoneal cavity by a constricted orifice, not narrow enough to cause strangulation, but which might easily interfere with the patency of the gut if it became distended. The peritoneal ring was freely divided and the intestines returned to the peritoneal cavity. The peritoneum was united and the wound closed above, layer by layer, and by the Bassini method below.

As there had been extensive transverse division of the muscles, the patient remained in bed six weeks. The healing was without infection, the stitches being removed on the tenth day. He had since been well.

EPIPHYSEAL SEPARATION AT THE UPPER EXTREMITY OF THE HUMERUS, WITH GREAT DEFORMITY

DR GEORGE E. BREWER presented a girl, aged thirteen years who was admitted to the Surgical Division of the Roosevelt Hospital in August, 1903. One hour before admission she had fallen down an air-shaft a distance of five stories. When brought to the hospital she was in a condition of profound shock and semi-

conscious The surface of the body was cold, the temperature subnormal, and the pulse almost imperceptible There were numerous bruises over the body, especially over the right side of the abdomen and thorax, and in the region of the right shoulder In the latter situation there was also considerable swelling, marked ecchymosis, and tenderness to the touch As her general condition was grave, no attempt was made to examine the shoulder more carefully at the time She was given an intravenous saline solution, and otherwise treated for the condition of shock

Two or three days later she was more carefully examined, when it was found that there was abnormal mobility and deformity at the shoulder-joint, but without marked crepitus

When her general condition had sufficiently improved to warrant her being moved, an X-ray picture was taken, which revealed an epiphyseal separation at the upper extremity of the humerus, the epiphysis apparently lying in the joint cavity, the upper extremity of the shaft being pushed outward and upward, and lying beneath the skin to the outer side and posterior to the acromion Under ether anæsthesia an attempt was made at reduction by manipulation Strong downward traction was made upon the arm, and when the shortening was overcome the elbow was carried vertically upward, as suggested by the late Professor E M Moore These manœuvres resulted in a complete disappearance of the deformity, the arm was secured to the chest by a plaster Velpeau dressing A subsequent X-ray picture showed the fragments in their normal position

ACUTE INFECTIOUS ARTHRITIS OF THE HIP-JOINT TREATED BY INCISION

DR ROYAL WHITMAN presented a girl, ten years of age, who was brought to the hospital in July, 1903, with the history that she had been very ill for two months The child was suffering great pain, she was much emaciated and unable to stand There was a large abscess over the outer aspect of the left thigh and the corresponding hip-joint was apparently diseased After emptying the abscess the joint was opened and the head of the bone turned out of its socket The cartilage was destroyed in places and the neck of the bone eroded The acetabulum was partly filled with granulation tissue, this was removed The abscess



FIG. 1—Incarcerated inguinal hernia—anterior view

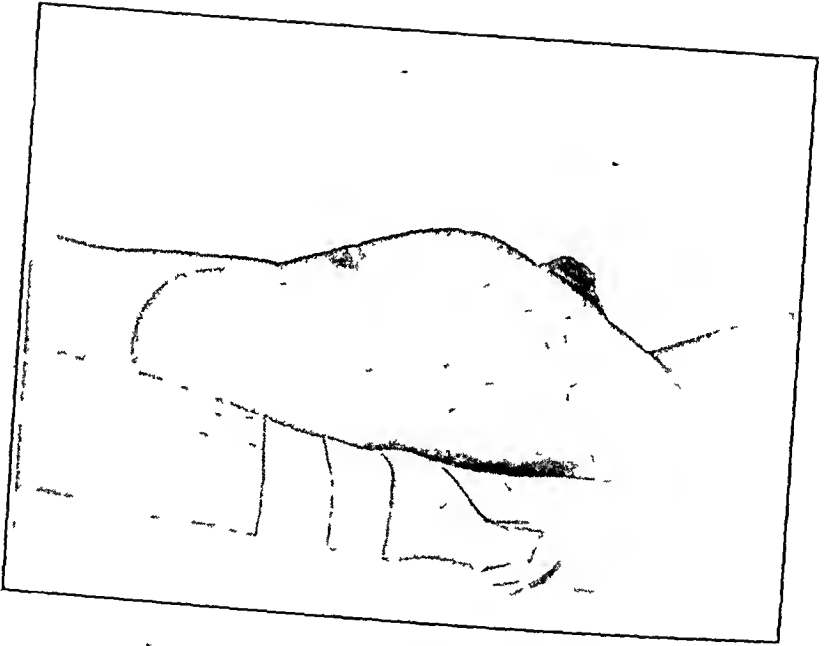


Fig. 2—Incarcerated inguinal hernia, lateral view

on the thigh did not communicate with the hip-joint. The head of the bone was then replaced, the wounds closed, and a plaster spica was applied. She now walks with but a slight limp. There is no displacement at the hip, no shortening of the limb, and the movements are but slightly restricted. There is no sign of disease. It is probable that the function of the joint will be eventually normal.

LARGE INCARCERATED HERNIA

DR CHARLES H. PECK presented a man, thirty-seven years old, who was admitted to the French Hospital in October, 1903, with the history of having had a left inguinal hernia for fourteen years. He wore a truss for a time, but during the past few years the hernia had been about the size of his fist and irreducible, and he had left off the truss. On the night previous to his admission, while working, the hernia suddenly increased enormously in size, reaching almost to his knees, and was tense, tender, and painful (Figs 1 and 2). It was operated upon without delay, eighteen hours after the sudden enlargement, on opening the sac, the neck of which was constricted at both external and internal rings, a large amount of fluid escaped, the remaining contents of the sac consisted of the entire cæcum with the vermiform appendix, ileo-cæcal junction, and the commencement of the ascending colon, together with coils of small intestine. The wall of the cæcum was thickened, and it was much dilated with an old constriction just above the ileocæcal junction, the appendix had no mesentery, but lay beneath a layer of peritoneum along the posterior aspect of the ileum. The coils of small intestine had descended behind the cæcum, evidently having caused the sudden enlargement. There was no strangulation. After relieving the constriction and placing the patient in the Trendelenburg position, the intestine was returned to the abdominal cavity. After reduction of the cæcum, a fold of peritoneum attaching the commencement of the ascending colon to the posterior abdominal wall just within the neck of the sac could be seen and felt, it was apparently the lower end of the ascending mesocolon, attached well to the left of the median line. The deep epigastric artery was felt to the inner side of the neck of the sac, proving the hernia to be of the oblique variety. The wound was closed by the Bassini method.

with chromic catgut, the result being quite satisfactory in spite of the enormous stretching of the tissues. A cigarette drain was placed at the lower angle in the great cavity in the scrotum. The wound healed by primary union without incident.

Dr Peck stated that the man also had a reducible right-sided omental hernia, which he intended to operate on shortly. The case was interesting on account of the huge size of the hernia, its unusual contents, and the satisfactory result of the operation. He thought it rather unusual to find the cæcum and appendix in a left inguinal hernia.

(The right hernia has since been operated on by the Bassini method, a piece of omentum eleven inches long by three and one-half inches wide being excised.)

DR GEORGE WOOLSEY said that while the case of incarcerated hernia presented by Dr Peck was remarkable as to size, the character of the contents of the hernial sac was not very unusual, quite a number of such cases being on record. The size of the hernia reminded Dr Woolsey of a case which he operated on two or three years ago, and in that instance the sac contained a large amount of fluid and a considerable portion of the large intestine, including the sigmoid and descending colon. The cause of the large amount of fluid showed itself later in the presence of a new growth involving the intestine and omentum.

SPLINT FOR FRACTURE OF JAW

DR CHARLES H. PECK presented a young man who was admitted to the French Hospital on October 6 with a fracture of the inferior maxilla through the lower part of the ramus. In spite of the application of the ordinary dressings, there was persistent posterior displacement. In order to overcome this difficulty, the House Surgeon, Dr Clinton B. Knapp, suggested the use of a splint which he had devised to overcome a similar difficulty in a previous case. It consisted of a strip of tin five inches wide in front tapering to three inches posteriorly, the anterior end bent upward to form a projecting shelf, and the strip fitted to the head, to which it was fastened by a circular plaster-of-Paris bandage. Its anterior curved end projected from the forehead, strips of adhesive plaster passing from the shelf downward and backward beneath the jaw, exerting traction upward and for-

ward, which entirely overcame the posterior displacement. Posteriorly the centre of the tin splint was cut away to avoid pressure on the occipital protuberance.

DR GALLAUDET said that very recently he saw a case of fracture of the inferior maxilla which demonstrated the futility of the ordinary four-tail bandage. In order to keep the fragments in apposition, he applied a narrow iron brace extending from the upper spine to the occiput, and thence over and beyond the forehead. This was kept in position by means of a plaster-of-Paris bandage, and by its aid a bandage was applied which prevented displacement of the fragments.

DR LILIENTHAL thought it advisable that in the treatment of a fracture of the lower jaw the surgeon should always associate with himself a dentist, and that in addition to the external apparatus an interdental splint should be applied to hold the teeth in proper occlusion, otherwise even slight irregularities of occlusion might give rise to a great deal of trouble. The interdental splints were made of metal, extremely thin, so that the patient hardly knew he had anything in his mouth.

DR PECK, in closing, said that in a previous case treated at the French Hospital the interdental splint had been tried and had proved a total failure. The displacement could not be corrected by any of the ordinary splints. In cases where the fracture passed between the teeth, the interdental splint might prove serviceable.

GASTROSTOMY FOR ŒSOPHAGEAL STRICTURE

DR F W MURRAY presented a man, fifty-six years old, who came under observation in May, 1903, with the history that up to eight months previous to that time he had enjoyed excellent health. He then first experienced some difficulty in swallowing, and in two months he was unable to swallow any solid food. The dysphagia gradually became more pronounced until he could no longer swallow milk. He became greatly emaciated, losing about fifty pounds in weight.

Upon admission to the hospital, an Œsophageal bougie was introduced, which revealed a stricture thirteen inches from the teeth line. It was very firm and gristly to the touch, and would not permit the passage of any instrument into the stomach. Even a small shot attached to a string failed to pass the constriction.

A gastrostomy was accordingly done, and since that time, a period of about six months, the patient has been feeding himself through the gastrostomy wound. Since the operation the man's weight has increased from 144 to 190 pounds. The patient had suffered considerably from hoarseness, and a laryngoscopic examination showed a general congestion of the larynx and partial paralysis of the left vocal cord, probably from pressure.

Dr. Murray said he was inclined to regard the stricture of malignant origin, although the improvement in the man's condition since the operation rather militated against that diagnosis. There was no history of syphilis nor ulceration of the œsophagus.

DR. ALEXANDER B. JOHNSON said that the cause of the œsophageal obstruction in Dr. Murray's case was possibly an aneurism, although its location would hardly correspond with that of an aneurism of the arch of the aorta. The partial paralysis of the left vocal cord rather favored that diagnosis.

DR. ELLSWORTH ELIOT, JR., recalled the case of a man of sixty years who developed an impassable stricture of the œsophagus, accompanied by a loss of flesh which was fully as great as in the case reported by Dr. Murray. A gastrostomy was done, which was followed by marked improvement. The man lived for ten or eleven years after the operation, and during that time he received all his nourishment through the gastrostomy wound. Those who had charge of the case were inclined to regard the stricture of specific origin.

Another case recalled by Dr. Eliot was that of a man of fifty-two years with an impermeable stricture of the œsophagus of doubtful origin. After gastrostomy he gained about forty pounds in weight and was able to return to his work. He died suddenly six months after the operation, and the autopsy revealed the fact that a malignant growth of the œsophagus had perforated through the pericardium.

The speaker said that, as a rule, the improvement following operation in these cases did not last long, but occasional exceptions had been recorded, especially with the scirrhus type of cancer, which was not unknown in the œsophagus.

He desired to inquire whether the patient had ever been infected with syphilis, and whether he had been subjected to mixed treatment.

DR F KAMMERER recalled one case of stricture at the lower end of the œsophagus, with marked impairment of the general health, where gastrostomy was followed by material improvement, and the patient lived for over two years after the operation. During this period he was fed entirely through the gastric fistula. The original diagnosis of malignant disease in that case was verified at autopsy. The patient had suffered from repeated hæmorrhages after operation, although bougies were never passed.

Dr Kammerer said he was inclined to believe that the case shown by Dr Murray was one of malignant disease of the œsophagus, situated somewhat below the level of the bifurcation of the trachea.

DR MURRAY, in closing, said that an X-ray picture in his case had failed to show any shadow. This would militate against the diagnosis of aneurism, as would also the fact that the stricture was completely impassable. The speaker said he agreed with Dr Kammerer that the case was one of cancer, probably of the scirrhus type. He thought it was located below the bifurcation of the trachea.

PARTIAL ENTEROCELE

DR LUCIUS W HOTCHKISS read a paper with the above title, for which see page 258.

DR COLEY said he had had but a single experience with a partial enterocele. The case was one upon which he operated about three years ago for a strangulated hernia of fifteen hours' standing. The patient's temperature was 101° F; he was vomiting, and complained of considerable pain. An immediate operation revealed a properitoneal hernia with a tight constriction involving about two-thirds the lumen of a knuckle of small intestine. The constriction was reduced without resection, and the patient made an uninterrupted recovery.

DR CHARLES N DOWD referred to a case of partial enterocele in a child which was interesting from a diagnostic stand-point. When the patient was brought to the hospital he had fæcal vomiting, and was in a depressed condition. The history given was, that a hernia had existed, but it had apparently been reduced, and no traces of it could be found, even with one finger introduced into the rectum and the fingers of the other hand pressed

over the inguinal region On account of the fæcal vomiting, an incision was made over the inguinal canal, and a partial enterocele was found The constricted section of gut was not large enough to be felt through the pubic fat The patient recovered without incident

DR JOHN B WALKER reported two cases of partial enterocele which had come under his observation One was in a woman of fifty years with a hernia that had been strangulated for forty-eight hours An operation was followed by recovery The other case was that of a man of sixty years with a strangulated femoral hernia that had apparently been reduced The symptoms of strangulation, however, did not abate, and after seventy-two hours a resection was done The case resulted fatally The speaker said his experience did not lead him to favor resection in the treatment of these cases

DR PECK reported the case of a woman of sixty years who gave no history of hernia, but who had suffered from intestinal obstruction for two days Upon placing her on the table preparatory to operating, a protrusion could be felt over the right femoral ring A herniotomy revealed a constriction of the intestine which included fully three-fourths of the lumen of the gut The constriction was relieved, and, as the gut was in fairly good condition, it was returned to the intestinal cavity The patient, who was in profound collapse at the time of the operation, failed to rally, and died in forty-eight hours

DR LILIENTHAL mentioned a case of partial enterocele without gangrene, which he operated on and which made a perfect recovery In cases where gangrene of the gut has occurred, the speaker emphasized the importance of extending the resection well beyond the actual limits of the diseased area on account of the well-recognized fact that the tissues of the adjacent gut are liable to have become devitalized In cases where an intestine of doubtful integrity had been put back, it was his practice to pass a long rubber ligature through neighboring healthy mesentery, the ends being left within reach, and by means of which the implicated gut could be readily withdrawn if the necessity arose

ABERRANT ADRENAL GROWTHS

DR F TILDEN BROWN showed a unique specimen of this kind which he had removed last September from the right side of a male Cuban, forty-six years of age, whom he had arranged to show this evening, and would have done so but for an attack of pneumonia developing a few days ago. It was an enormous tumor, lobulated like a foetal kidney, and composed entirely of adrenal tissue, no vestige of renal glomeruli being thus far found¹. The structure of the growth is of great interest in connection with the fact that two years ago, when Dr Brown first saw the patient, there existed anuria on this right side, as was proven by two ureter catheterization tests at about a three weeks' interval. On the second occasion the ureter catheter was retained for nearly three hours, and the patient, at times in the vertical position, walking about. At this time the kidney was not appreciably enlarged. It was not palpable, but the examination elicited a trifling tenderness. An X-ray plate was negative, and tubercle bacilli were not found in the sediment of the voluntarily voided urine. No diagnosis was reached. And as the patient had during his summer visit North improved in health and gained in weight, as well as noted a nearly complete cessation of hæmaturia, he was advised to return to Cuba and report his condition from time to time. Such messages were always to the effect that blood was no longer seen in the urine, or but a faint shred of it at long intervals. No allusion was made to a tumor development in the side. For this reason the appearance he presented when appearing again this past summer was at once a surprise and a revelation. Neither vest nor upper part of the trousers could be brought together by their buttons. This in conjunction with the past history afforded a ready diagnosis of renal growth. The first suspicion of any ailment had been noted by this patient three years before, when one night he saw blood in his urine and had a pain in the right side. Such attacks of hæmaturia with or without pain had recurred at almost regular monthly intervals on five occasions, with an average duration of thirty hours. Then for some three months the appearance of blood in the urine was of irregular

¹ One section shows the remnants of two uriniferous tubules

shorter duration, but more frequent occurrence, until at the end of about ten months from the first onset it had practically ceased altogether. Dr Brown said he expected to give a complete history of the case at some future time in conjunction with a review of these interesting but not at all uncommon renal neoplasms. In regard to the case just reported, the speaker said the facts noted afforded some reasons for the query as to the possibility of a kidney being so entirely made up of adrenal gland tissue, even at a time when it was not appreciably enlarged, as to be practically functionless as an excretory organ.

He would now only like to take advantage of the opportunity to briefly show several kidneys in which more or less of each gland had been supplanted by aberrant adrenal growth. One of these, a large, solid organ, had been removed by Dr McCosh a few days ago from a man of sixty-five years, who had had his first symptoms, consisting of hæmaturia, some ten years before. In this case, also, there had been cessation of this symptom for a long time. Another similar specimen, but not so large, was the result of a successful left nephrectomy in a male adult by Dr W N Swift, of New Bedford. In this case a recent note from the operator reports that the patient died two years afterwards from metastasis. The fourth specimen, and one showing a small lemon-sized growth in the upper pole of a left kidney, was removed at autopsy from a woman dying of iliac thrombosis following hysterectomy. Here there had been no renal symptoms whatsoever.

DR LILIENTHAL said he had seen three cases of aberrant adrenal tumors. In two of these the growths were very large. The first case was in a man who died from a prompt recurrence. The second case was in a woman who was operated on a year ago. Very recently she developed a tumor in the frontal region which had every appearance of an aneurism. Upon exposing it, he found that it apparently communicated with the brain or possibly with the diploë. The speaker said it was well known that these adrenal growths were apt to recur in the liver or bones. While the frontal tumor in this case had all the signs of an eroding aneurism, it might be a very vascular growth secondary to the adrenal tumor which was removed a year ago. The first and most important symptom in all these cases, Dr Lilienthal said, was renal hæmaturia.



Adrenal tumor

DR ELIOT, who had seen Dr Brown's patient prior to operation, said the man was very cachectic, and had this immense tumor over the region of the right kidney. The growth was partially cystic, which was due to obstruction by portions of the tumor of several of the calices of the organ.

DR A. J. MCCOSH said that in his case hæmaturia appeared seven years prior to operation, it had been intermittent in character, but it had been more or less constant during the four years prior to removal of the kidney.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting, May 11, 1903

The President, RICHARD H HARTE, M D, in the Chair

GASTRIC AND DUODENAL SURGERY

DR WILLIAM J MAYO, of Rochester, Minnesota, read a paper entitled "A Review of 303 Operations upon the Stomach and First Portion of the Duodenum," for which see ANNALS OF SURGERY, July, 1903, page 30

PROFESSOR VON MIKULICZ, of Breslau, said that the question discussed by Dr Mayo as to which is the best operation for establishing a new communication between stomach and small intestine is of the greatest importance, but he did not consider this question to have been finally decided. There is no doubt but that operation is the best one which most completely restores the physiological relations. From this stand-point the operation of pyloroplasty stands at the head. Next in importance is the operation of gastroduodenostomy. If one of these two operations for technical reasons should not be feasible, one then has to consider the operation of posterior gastrojejunostomy according to Von Hacker, which, if correctly performed, yields excellent results. Least to be recommended is the operation of anterior gastroenterostomy. He would no longer perform this latter operation in benign affections of the stomach, on account of the most recent experiences which have shown that a peptic ulcer of the jejunum occurs after such operations with relative frequency. He considered this operation permissible only in gastric carcinoma in which the normal acidity of the gastric juice is absent.

As to Finney's operation, he considered it a very practical technical modification of pyloroplasty, but in the main one accom-

plishes precisely the same with the original operation of pyloroplasty, providing this operation is only properly executed. As to the Murphy button, in benign affections of the stomach, he did not employ it. In operations for gastric carcinoma, however, he employed it very frequently, as also in gastro-enterostomy and in resection. In the latter operation he considered the Murphy button indispensable, whether he operated according to the first or second method of Billroth. The technique is simpler, quicker, and much safer. When it is possible, he employed the first method of Billroth, which is the joining of the stump of the stomach with the duodenum, because this method again restores completely the physiological relations. Only in cases where this method cannot be performed, on account of either shortness or immobility on the part of the duodenum, did he employ the second method of Billroth, namely, the joining of the stump of the stomach with the jejunum. Regarding the relation between the number of benign and malignant diseases of the stomach, it had impressed him that in America the former, especially gastric ulcer, was the more numerous class, while carcinoma of the stomach occurred relatively less frequently. In Germany this proportion is reversed, at least he as a surgeon saw four times as many gastric carcinomata as gastric ulcers with their complications. Perhaps the frequency of gastric ulcer in America may be associated with what in our estimation is the not very natural nourishment which the American ingests, namely, ice-cold drinks and highly seasoned foods.

As far as the indications for operative procedure in gastric ulcer are concerned, it must not be forgotten that in this disease medical treatment is able to contribute much benefit. Furthermore, the surgical experience in this direction is still far too meagre to enable one to positively contend that in the operative procedure there is an infallible remedy for gastric ulcer itself. The whole question is by no means as yet decided, and therefore German surgeons are very reserved in considering the indications that are present in simple gastric ulcer.

Other cases, of course, are to be considered according to the complications which offer clear indications for operation, as, for instance, stenosis of the pylorus and hour-glass stomach.

In acute hæmorrhage they refrain, as a rule, from looking for the bleeding ulcer, as this is generally a too difficult and

unsafe a procedure They do, however, perform gastro-enterostomy and at the same time a jejunostomy, as by means of the latter the patient may be exclusively nourished for weeks, and only in this manner the functional activity of the stomach is eliminated As far as the localization of gastric carcinoma is concerned, his experiences did not coincide entirely with those of Mayo If the results of post-mortem examinations are compiled, it will be found that certainly in the majority of cases the pylorus is included in the carcinomatous process If, however, the results of the operations are considered, that is in the earlier stages of carcinoma, it will be found that the lesser curvature is most frequently affected by the carcinoma, which then attacks the pylorus secondarily According to his experience, carcinoma of the stomach is situated in about 40 per cent of cases primarily in the lesser curvature, and only in 20 per cent of cases primarily in the pylorus As far as the technique of the radical operation for gastric carcinoma is concerned, he referred to his numerous publications on this subject For the last eight years, as a matter of principle, he had not only extirpated all the lymphatic glands at the greater curvature, but also the whole omentum with the lymphatic glands and lymph channels as far as the cardia The technique is accurately published in the text-book of practical surgery by Von Bergmann, Von Bruns, and Von Mikulicz The permanent results following resection of gastric carcinoma are in the main quite encouraging His statistics show that 16 per cent of those operated upon remain free from recurrences for over three years But also in those cases which are not radically cured, resection of the stomach yields more than gastro-enterostomy Some of the cases do not have any local recurrence, but after a longer period has elapsed metastases develop, living from one and one-half to two and one-half years without gastric disturbances He therefore preferred resection of the stomach to gastro-enterostomy, even if there are no positive prospects present for a radical cure of the carcinoma

MR B G A MOYNIHAN, Leeds, England, said that he thought the operation of pyloroplasty might be practically discarded He had only done the operation three times In the first the patient made a good recovery, and was one of the most satisfactory stomach patients that he had ever operated upon Of the remaining two cases, one was partially improved, in the

other a gastro-enterostomy was performed four or five months after the original operation. He felt very decided that the operation of pyloroplasty was by no means so satisfactory in any single particular as the operation of gastro-enterostomy. For simple diseases of the stomach he had operated up to the time of his leaving England upon about seventy-five cases with only one death.

He had used the Murphy button, but in the last sixty-five operations that he had done he had not used it. The button had, however, been a very important step in perfecting his operation of gastro-enterostomy. It had taught him to remove the mucous membrane, which is so necessary in order to secure perfect anastomosis with an opening patent from the first.

Dr Mayo had laid down the laws for the treatment of malignant disease of the stomach on almost the same lines as he had emphasized some two years ago in a paper read before the Clinical Society of London. The extension of malignant disease occurs principally through the lymphatic system. He described three areas,—one along the greater curvature, one along the lesser curvature, and one at the fundus, an area which he had described as an "isolated area." In the beginning he removed the whole of the lesser curvature, and the whole of the greater curvature up to the level of the hilum of the spleen. This leaves the "isolated area" of the stomach, and the only disadvantage that it has is that the pathology is not perfect, because the lymphatics of this area are in association with the lymphatics of the lower end of the œsophagus. In reference to the question of duodenal ulcer, as the cases had come to him, he thought it is very seldom primary. He did not remember ever seeing duodenal ulcer without a gastric ulcer. It is known that gastric ulcer is frequently associated at some period with hyperchlorhydria. There result first the gastric ulcer, and then a peptic ulcer in the first portion of the duodenal wall. He had seen cases similar to those which Dr Mayo had described in which there was gastric ulcer, and a gastro-enterostomy was done, and peptic ulcer was formed in the outside loop of the jejunum. Gastric ulcer is frequently multiple. In a very considerable number of cases, roughly speaking, gastric ulcer is not a solitary condition, there are more ulcers than one in the majority of cases. Therefore excision of gastric ulcer is very rarely necessary. He

had excised the ulcer for hæmorrhage in one case only, and that case died. This was the only case which he had lost. In the other cases he had performed the operation of gastro-enterostomy without bothering much about the ulcers.

DR ALBERT VANDERVEER, of Albany, said that although in past years he had felt that ulcers of the stomach could be largely benefited and brought to recovery by a medical line of treatment, and he had presented a number of cases in an article on the subject some years since, yet he realized the very impressive lesson brought out by Dr Mayo in his large number of cases, the great majority being chronic ulcers, which gave a very positive evidence of the tendency of the cicatricial areas to later present malignant degeneration. He endorsed all that Mayo had said upon this subject, and could not agree with some of our writers at the present day that ulcer of the stomach is not a surgical lesion.

In regard to the surgical treatment of cancer of the stomach, he quite agreed with Dr Mayo that laboratory methods of investigation are not yet as clearly developed and positive in their conclusions as could be wished, so far as rendering aid in doing an early operation. Medical men who are making this subject a specialty, as regards investigation of the contents of the stomach as to the presence or absence of hydrochloric acid, the presence of lactic acid, the Boas bacillus, etc., are apt to procrastinate, and not infrequently the patient's chances are seriously interfered with by waiting too long before advising operation.

There is much truth in the remark that when once a tumor is felt, cancer of the stomach has become a very serious complication.

He quite agreed with Dr Mayo that a clinical diagnosis can generally be made sufficiently correct to make it quite proper to advise a prompt operation. When once the abdominal cavity has been opened, and one is able to investigate the stomach carefully, then the extent of the glandular involvement should control largely as to a resection. He was quite positive that unless one made a complete removal of the infiltrated glands, and in doing a resection got well beyond the diseased portion of the stomach, or in doing a gastrectomy did it completely, some of the palliative operations were very much more desirable, and of greater service to the patient.

From a personal experience with quite a large number of

cases of gastric cancer he had seen great good result from a simple gastro-enterostomy or gastrostomy

In pyloric stenosis, without many adhesions to the surrounding portions, and when it is plainly apparent that the lesion is non-malignant, he endorsed most earnestly Dr. Mayo's statement in regard to pyloroplasty

Gastrojejunostomy had been with him a gratifying operation. It is certainly very pleasing to see the relief these patients obtain from this procedure from the perfect gastric drainage that is afforded

Gastroduodenostomy had been with him a very difficult operation, and one that he had not done very frequently

DR J M T FINNEY, of Baltimore, remarked, as to the treatment of pyloric stenosis of benign origin, that the solution of this problem could be expressed in one word, "Drainage," and this must be both permanent and effective. Any method, it seemed to him, that fulfilled these two requirements would be satisfactory, but it remains to be proven which is the best method.

At the present time, the advocates of gastro-enterostomy are certainly in the majority, both in numbers and professional eminence, but some of the other methods are or have been advocated by men whose opinions are worthy of consideration

He had seen many cases of pyloric stenosis from one cause or another which had been much benefited by medical treatment, and a few in which the up-to-date physician had been able to avoid a surgical operation. He believed that if we were more careful in our methods of examination, if we studied our cases a little more closely for longer periods of time, and if we called in the aid of the physician more often, we would accomplish results, not as speedily perhaps, but in a way fully as satisfactory to the patient as if we rushed hastily into a surgical operation

Early operation, certainly in the majority of cases, has many points to commend it, but in doubtful cases the surgeon should call to his aid the physician, and that speedily and so should the physician call upon the surgeon, not perhaps with the idea of immediate operation, but in order that the case may be more intelligently and satisfactorily considered. He was an advocate of early operation in proper cases but he could not subscribe to all that had been said in this respect. He believed, also, that

cocaine was a valuable agent in cases where, for any reason, the general anæsthetic is contraindicated in making an exploratory incision. He had used it frequently with the greatest satisfaction and had never seen any untoward results. The mortality in all operations upon the stomach is growing steadily less until now the mortality rate is extremely low.

As to operation for the relief of benign stenosis of the pylorus, the operation of pyloroplasty, after the Heineke-Mikulicz method, has not given general satisfaction, although in the hands of Von Mikulicz it had been productive of excellent results, but, as Dr Mayo suggested in his paper, in the way in which it has been performed in this country, at any rate, it has been followed by a considerable number of recurrences.

The operation of pylorectomy must of necessity always be attended with a relatively high mortality, and for this reason it is only to be recommended in cancer. Dr Finney had during the last two years performed pylorectomy eight times. He had followed practically the method of Hartman. Six of these cases made good recoveries from the operation and lived varying lengths of time, two or three are still living. It would seem, however, that so far as cure is concerned, from the nature and extent of the tissues affected and the lymphatic involvement which necessarily follows, that it is, and very likely always will be, next to impossible to eradicate entirely the cancerous growth, and that we must always look forward to a recurrence of the trouble, either locally or elsewhere. For this reason, the operation which offers the greatest amount of temporary relief at the least possible risk is the operation of choice.

In regard to gastro-enterostomy, he hesitated to say anything against it, because so much had been said in its favor by those whose opinion and experience were both greater and more weighty than his, but, unfortunately, the results of all surgeons, he was sure, were not the same as those they had listened to. Most surgeons had met all too frequently with unfortunate results after the employment of this operation. They are constantly meeting with cases which may have done well perhaps from the immediate operation, but which have later vomited themselves to death or have given other obstructive symptoms. Many efforts have been made to overcome the objections which have been urged, and which have made themselves evident after this

operation, and the satisfactory results reported by some of the previous speakers bore witness to the efficacy of their efforts, but the majority of operators had not had the same satisfaction.

Some of the objections that have been urged are inherent in the operation, and cannot be overcome as long as the operation is performed in the manner in which it is at present. Some of these objections may be more theoretical than practical, but it would seem that the normal position of the pylorus was the proper one, and any operation which preserves the normal relations is better than one which disturbs them.

Of course, the final test of an operation is what it does so far as the patient's health and comfort are concerned. Scientific observation of the work done by the stomach will throw a great light upon the relative value of the different methods.

Dr. Friedenwald, of Baltimore, had kindly made repeated chemical examinations of the stomach contents in five of his cases of pyloroplasty, in all of which it was found that, from very abnormal conditions before the operation, the patients had all returned to a practically normal condition in a comparatively short time after the operation.

With regard to the operation of pyloroplasty as suggested by himself at the Meeting of the American Surgical Association in Albany in 1902, and which it is unnecessary to describe again, this operation has this advantage over all operations in that it both makes the point of drainage at the lowest or approximately lowest point in the stomach and yet still preserves the normal relation. At the same time it is easy of accomplishment. It offers immediate relief to the patient in that the drainage is accomplished at once, and the outlet is so large as to make it very free. The after troubles are surprisingly little, and adhesions are no bar to the performance of the operation. It can be carried out in the presence of still active ulceration. He recently excised an ulcer on the posterior portion of the pylorus with very satisfactory result. It remains to be seen by a more extended use of the operation whether or not it is really the best at our disposal for the relief of benign stenosis of the pylorus. Of the thirty-eight cases which he had been able to collect the mortality had been seven and one-eighth per cent.

EDITORIAL ARTICLE.

BLOOD-PRESSURE IN SURGERY AND THE TREATMENT OF SURGICAL SHOCK

IN the essay by Dr Crile, of Cleveland, to which the Cartwright Prize of the Alumni Association of the College of Physicians and Surgeons of New York City was awarded in 1903, and which has been published in book form,¹ is to be found a continuation of the author's experimental research into surgical shock published in 1897. The present research is an attempt to ascertain by scientific experimental methods the effects of various drugs and methods of treatment in preventing or antagonizing or correcting the conditions already established by the previous experiments as constituting surgical shock. The present volume is divided into two separate parts. In the first are given in detail the protocols of 251 experiments upon 243 animals. In the second part the experimental data obtained are summarized and the conclusions are stated. It is in this second part that the surgeon will find most of interest, all the more so since the questions studied are of primal importance, and the conclusions enunciated are in many instances in contradiction of widely accepted practice.

It is essential that the reader keep in mind the distinction, and a most important practical one it is, which the author makes between the immediate sudden depression which may result from cardiac failure, from hæmorrhage, or from injuries of the vasomotor centre, and the more gradually developed depression which

¹ BLOOD-PRESSURE IN SURGERY. By GEORGE W. CRILE, A M., M D., Professor of Clinical Surgery, Western Reserve Medical College. Philadelphia J B Lippincott Company, 1903. Large 8vo, pp 422.

is due to the exhaustion of the vasomotor mechanism; impaired cardiac and respiratory action, hæmorrhage, anæsthesia, temperature, may all contribute in some degree to the final result, but the important thing is the vasomotor breakdown from overstimulation. To the first described condition the term *collapse* is appropriate, here there is a suspension of function rather than an exhaustion of centres. To the second condition alone is the term **SHOCK** applied by Crile. Accepting, then, the author's statements that in shock the essential phenomenon is diminution of the blood-pressure, due to an exhaustion of the vasomotor centres, it is interesting to note the results of his experiments in the administration to animals suffering from shock of the drugs most commonly relied upon in surgical practice. Alcohol acted as a depressant, the more profound the shock the more marked was the depressing effect of alcohol. Nitroglycerin and amyl nitrite, also, were found to distinctly increase the rapidity of the decline in animals in deep shock. They increased shock instead of relieving it. Strychnine gave no better results, in any degree of shock, after the administration of a therapeutic dose of strychnine, the animals passed into deeper shock. Digitalis gave but little better results, for, although it usually caused a rise in the blood-pressure when given in various degrees of shock, it was found, however, that on the average cases of shock treated by digitalis did not live as long as the controls, that is, as long as similar animals under the same conditions to whom the drug was not given. This result seemed to be due to sudden cardiac failure from overstimulation. The author very justly remarks that there seems to be but a limited range of possibilities for heart stimulants in the condition of surgical shock. Stimulants acting upon the vasomotor, the cardiac, and other centres of the medulla are, on the whole, either inert or harmful.

The effects of adrenalin are more promising of good; in the normal animal in every degree of shock and collapse adrenalin administered intravenously caused a rise in the blood-pressure,

the force of the heart-beats was increased and the peripheral blood-vessels were contracted. But its effects are very transient, on account of the rapidity with which it is oxidized in the blood, so that its most effective method of administration was found to be by a continuous intravenous infusion in salt solution in strength of from 1 to 50,000 to 100,000. A burette, the rate of flow from which is controlled by a screw-cock attached to the rubber tube, may be used for its administration. Great caution must be exercised in its administration, for in an overdose it has a marked inhibitory effect upon the heart, and hence the circulatory phenomena should be under continuous observation. Whether it is a practical therapeutic agent, however, still remains to be established by its clinical use. Its inhibitory action upon the heart may be relieved by an injection of atropine.

Saline solution, intravenously or subcutaneously introduced, in every observation caused a rise in the blood-pressure, which was usually gradual, and was sustained in proportion to the degree of shock present. In the cases of moderate shock the gain in pressure was fairly well sustained, in deeper shock the rise was not so marked and not so well sustained, in case of the deepest shock the rise in the blood-pressure was not sustained beyond a certain time, even during the infusion. The solution is not retained in any considerable quantity in the blood-vessels, but is eliminated rapidly. Its range of usefulness is thus limited.

External pressure, as by bandages to the extremities, or by broadly applied pressure upon the abdomen, naturally suggests itself as a means of overcoming the accumulation of the blood in the veins resulting from vasomotor exhaustion, and of causing the blood to flow towards the heart. The real value of peripheral bandaging in raising and maintaining a rise in the blood-pressure was demonstrated in many of the experiments made. An ingenious device for the systematic application of external pressure was devised by the author, called by him a "pneumatic suit." This was constructed of a double layer of rubber cloth, enclosing

spaces to be inflated at will by a bicycle air-pump, whereby one or more of the limbs or the abdomen, separately or in any combination, might be subjected to pressure at will. The value of the apparatus to sustain the blood-pressure in conditions of shock, the author claims to have been strikingly demonstrated in repeated instances.

Morphine administered previous to the infliction of a traumatism, the author finds lessened to a considerable degree an animal's susceptibility to shock, and thereby made possible more extensive operations and procedures prolonged over a longer period of time. The clinical application of this finding is obvious.

The final summary of the author is as follows:

"In many instances the control of the blood-pressure is the control of life itself. Surgical shock is an exhaustion of the vasomotor centres. Neither the heart muscle, nor the cardiac centres, nor the respiratory centres are other than secondarily involved. Collapse is due to a suspension of the function of the cardiac, or of the vasomotor mechanism, or to hæmorrhage. In shock, therapeutic doses of strychnine are inert, physiologic doses are dangerous or fatal, if not fatal, increased exhaustion follows. Stimulants of the vasomotor centre are contraindicated. In shock, cardiac stimulants have but a limited range of possible usefulness and may be injurious. In collapse, stimulants may be useful because the centres are not exhausted. Saline infusion in shock has a limited range of usefulness, in collapse it may be effective. In shock it raises but cannot sustain the blood-pressure. Adrenalin acts upon the heart and the blood-vessels, it raises the blood-pressure in every degree of shock, it is rapidly oxidized by the solid tissue and by the blood, its effects are fleeting, it should be given continuously. In excessive doses there is a marked stimulation of the cardio-inhibitory mechanism, due caution must be exercised in its use, its clinical value still remains unproved."

The possible relationship of body temperature, either in the production of shock by its lowering, or in the prevention or

alleviation of shock by its elevation, does not seem to have as yet engaged the attention of Crile. Readers of the ANNALS OF SURGERY will doubtless recall the observations of Kinnaman on this point, as published in the December, 1903, issue of the Journal. In view of the conclusion of this last-named experimenter, that "temperature commands first place by its power of production, by its power of limitation, and by its power of amelioration of the composite condition,—shock," we shall look with interest for some future publication of Crile of results of his own experiments upon the effects of cold and heat upon shock. Kinnaman found that a rise of the temperature caused a rise in the blood-pressure and the respiratory rate (reduced in shock), with the result of a gradual amelioration of all the symptoms. If surgeons must abandon such time-honored agents as alcohol and strychnine, digitalis and nitroglycerin, in the treatment of shock, it will be a satisfaction to know that heat and friction are left to them.

It is obvious that in ordinary surgical work "pneumatic suits" are out of the question, while continuous infusions of adrenalin solutions are possible only in laboratory conditions. Saline infusions and subcutaneous injections are more generally practicable, and bandaging of the extremities is always available. It would appear as if these, with hot bottles and rubbings, were to constitute the therapeutic resources of the future against shock.

LEWIS S. PILCHER

REVIEWS OF BOOKS.

THE PRINCIPLES AND PRACTICE OF SURGERY, Designed for Students and Practitioners By GEORGE TULLY VAUGHAN, M D , Assistant Surgeon-General, Public Health and Marine Hospital Service of the United States, Professor of the Principles and Practice of Surgery, Georgetown University, Washington, D C Philadelphia and London J B Lippincott Company, 1903

This volume is clearly written, its arrangement is good, it is up-to-date, and, for the most part, it presents only well established facts The chapters on syphilis, aneurism, tuberculosis of the spine, and appendicitis are particularly to be commended for their concise and thorough exposition of the subjects discussed

No mention is made of the use of the cautery in the treatment of anthrax, of the Matas method of arteriorrhaphy for aneurism, or of the simple and useful method of dry stretching of the nerve for sciatica

Most surgeons would probably feel that they were not doing justice to their patients by giving saline infusions at a temperature of 100° F , and they would scarcely choose to treat fractures of the shaft of the humerus by a method which has frequently resulted in non-union The abdominal surgeon could hardly accept the unmodified statement that "the diagnosis of intestinal obstruction is not difficult," providing he hopes to make that diagnosis sufficiently early to effect a cure, and he would doubtless remind the author that small fæcal fistulæ do not heal if they lead to the small intestine

At the present time it seems that there is a great demand for one-volume surgical treatises While it may be seriously ques-

tioned if a work of 533 pages can adequately cover the subject of general surgery, even with the omission of such special branches as ophthalmology, gynæcology, etc., nevertheless, such a condensed text-book will be of special use to a student in his preparation for examination, and to the practitioner, who will regard it rather as an index to the progress of surgery than as a complete guide to diagnosis and treatment

THOMAS BRAY SPENCE

DAS GEWEBE UND DIE URSACHE DER KREBSGESCHWULSTE Unter Berücksichtigung des Baues der einzelligen thierischen Organismen Von DR LUDWIG FEINBERG Berlin Verlag von August Hirschwald, 1903

In this treatise the author maintains that in order to study the subject of the parasitic origin of the carcinomatous tumors, it is necessary to consider and understand the various forms of Protozoa. He wishes to show that from this consideration there may be deduced a general law, which applies not only to the single classes of one-celled animal organisms, but also to the entire group of Protozoa in general. That without discovering some such law, it is not possible to diagnose and classify any single-celled, isolated organism. He hopes that the deductions and conclusions which he is able to draw from the histological findings in the carcinomatous growths may also be found of value in explaining the etiology of Sarcomata and various skin diseases.

The work of other writers is often referred to. He holds that the lack of knowledge of the true characteristics of the Protozoa often gives rise to false conclusions. This he exemplifies in the case of some observers who have described as amœba certain cells found in the ascitic fluid in cases of carcinoma of the liver, basing their conclusions upon the amœboid movements which are seen. But these conclusions are only based upon false premises, for these same characteristics may be observed in free

cancer cells, freshly prepared, and examined in normal salt solution upon a heated stage

The work is divided into two parts. Part I discusses the single-celled animal organisms. The Rhizopoda, Mastigophora, Sporozoa, and Ciliata are considered at length. The author goes into the minute structure of these organisms, paying especial attention to the structure of the nuclear body, the amount of chromatin contained, and its relation to the protoplasm. Then follows a comparison of these single cells with the normal tissue cells.

Part II is devoted to the tissue and the etiology of the carcinomatous growths. The author describes a single-celled animal organism as the etiological factor. This parasite he calls the *Histosporidium Carcinomatosum* n. g. n. sp., the nomenclature being based upon its histological resemblance to the Sporozoa, and its subclass the Neosporidia, and from the fact that the carcinomatous growth depends upon the presence of this parasite in the epithelial cells. There are two forms of this parasite, "die Form der Zellinfection" (parasite in the cell), and "die Form der diffusen Infiltration" (parasite between the cells). They represent two stages of the growth, i. e., the development and the degeneration.

The author has attacked the subject in a thoroughly scientific manner, and his work deserves the attention of those interested in this line of research.

PAUL MONROE PILCHER

ANATOMY OF THE BRAIN AND SPINAL CORD. By HARRIS E. Santee M.D. Ph.D. Third Edition. Chicago: E. H. Colegrove 1903.

This is the third revised and enlarged edition of this excellent book. The arrangement of the book is such that the student can best trace the conducting paths by the grouping and chaining of neurones. There is an orderly subordination of the minor

parts of the text The different parts of the brain are displayed in connection with their physiological connections The operculum and posterior part of the inferior frontal gyrus are shown with relation to their function as the centre of speech Attention is similarly given to the ascending frontal, ascending parietal, and superior parietal convolutions as the best known motor areas of the cortex, also the temporal lobe as the probable seat of the centres of taste, smell, and hearing

Comparative anatomy is also invoked to show the origin of the olfactory lobe in man and its antecedent in the lower animals

The author shows the complex human brain as developed from a simple vesicular prototype This book makes clear the paths of impulses, and enables the student to trace physiological functions through the nervous system

In speaking of the various organs and parts of the nervous system, the author renders its identification more easy and its relations more simple by naming its function Thus "The pyramidal tracts are motor," "Gower's tract probably carries thermic and pathetic impulses," "Goll's column carries impulses of the muscular sense," "All varieties of impulses are carried by Burdach's column," "The direct cerebellar tract conveys impulses of equilibrium received especially from the viscera"

The author in the first edition used the old definition of neuron according to Waldeyer He describes the neuron in this new edition as being a nervous entity, in the embryo structurally independent of all other neurones In the adult their predominant relation continues to be that of contact The different types of neurones are described and classified The qualities peculiar to dendrites and axones are described and classified

An elaborate and valuable table, giving the deep origin of the sensory nerves from their terminal nuclei, is furnished

One chapter is devoted to the tracing of impulses through the better known paths formed by the various nervous groups

These are treated under three headings the motor, sensory (including general and special sense), and reflex

The last chapter of the book is given to the embryology of the brain and spinal cord

There are but few illustrations The index is full and good The book is interleaved with blank pages for the addition of notes

JAMES P WARBASSE

CORRESPONDENCE.

CLOSURE OF ABDOMINAL WOUNDS

EDITOR ANNALS OF SURGERY

IN your November issue is a paper on "Abdominal Closure by a New Method," by Dr J F Baldwin. The method consists in adding to the usual through-and-through sutures of all the layers a continuous, non-absorbable suture of the fascia, so placed as to be withdrawn at the same time the other sutures are removed.

Permit me to state that practically the same method was devised by me many years ago. It was given wide publicity more than five and a half years ago in a paper read before the Association of Baltimore and Ohio Railway Surgeons, and by its publication in the *New York Medical Record*, November 28 1898.

If at this date, therefore, the term "new" can properly be employed, it must be with respect to the suture material used and not to the method.

ROBERT J REED

WHEELING, W VA, December 1, 1903

TO CONTRIBUTORS AND SUBSCRIBERS

All Contributions for Publication, Books for Review, and Exchanges should be sent to the Editorial Office, 386 Grand Ave., Brooklyn, N Y.

Remittance for Subscriptions and Advertising and all business communications should be addressed to the

ANNALS OF SURGERY,

227-231 South Sixth Street, Philadelphia

ANNALS OF SURGERY

VOL XXXIX

MARCH, 1904

No 3

ORIGINAL MEMOIRS.

RADICAL OPERATIONS FOR THE CURE OF CAN- CER OF THE PYLORIC END OF THE STOMACH

BY WILLIAM J MAYO, M D,
OF ROCHESTER, MINNESOTA,
Surgeon to St Mary's Hospital

SEVENTY per cent of all gastric carcinomata involve the pyloric portion and 60 per cent have their origin at the pylorus or within three inches of it. Considering the fact that radical operation was successfully performed in the time of Billroth (1881), before the inception of modern abdominal surgery, and that during the succeeding twenty-two years more or less work has been done in this field, it is curious that pylorotomy and partial gastrectomy have not as yet achieved an accepted surgical position. There have been a number of reasons for this anomaly, first, a belief that the diagnosis could not be made before the case had advanced beyond the possibility of cure, and, second, that the operation was difficult, prolonged, and bloody, with an almost prohibitive mortality. The first proposition is to a considerable extent true, but not entirely so, as we have in exploratory incision the one diagnostic resource which is reliable, and which must be resorted to in the large majority of cases before a surgical diagnosis can be made.

Without it the truth is but slowly established, at the expense of progressive hopeless involvement. Exploration can be safely accomplished through a small incision and with a short time of disability. It is said that the patient will not submit to an abdominal incision upon suspicion. Herein we do the intelligence of the public an injustice, we have seldom been refused the opportunity, when the matter has been fairly and candidly laid before the patient and his friends. The plea for delay has more often come from the attending physician.

Without going into the question as to the symptoms which would constitute a basis for exploration, the writer would express the opinion that the early diagnosis must be based upon clinical phenomena, the result of observation and experience.

In attempting to solve some of these problems, we have encountered a number of misleading statements which seem to have been generally accepted. Of these three are of sufficient importance to deserve brief discussion: (a) The value of laboratory methods of diagnosis, (b) The significance of palpable tumor, (c) The history of previous ulcer.

(a) Laboratory methods of diagnosis are chiefly based upon chemistry of the gastric secretions (test meals and so forth) and the microscopical examination and chemical reactions of gastric "findings," as well as the urine, fæces, and blood. In the surgical stage these examinations have little value, but gain in the diagnostic importance with the progress of the disease to become of the greatest value only when the patient is in hopeless condition. My colleagues, Drs. Graham and Millet, in the examination of somewhat over 1500 stomach and duodenal cases, of which 430 came to operative demonstration, showed this beyond question. These examinations should be made, but exploration should not be delayed by reason of the inconclusive nature of the results.

(b) Tumor. The dictum was advanced many years ago that the presence of a tumor of itself demonstrated inoperability. This is by no means true, a small movable tumor in the pyloric region may be a favorable indication. The early diagnosis of cancer depends in a great measure upon the introduc-

tion of mechanical phenomena from obstruction at the pylorus, with or without palpable tumor, and it is the interference with gastric motility which early calls the attention of the patient to his trouble, and not the presence of the cancer itself. Without these symptoms a surgical diagnosis would seldom be made. In our experience, the patient with marked symptoms of cancer of the stomach, but without any evidence of pyloric obstruction, proves on exploration to be the victim of advanced and hopeless disease of the body, in which there were no symptoms during the operable period.

(c) A history of previous ulcer with complete recovery during a prolonged period of time is apt to be taken as an indication that a present gastric trouble is due to a recurrence of the ulcer and lead the patient and attendant physician to postpone interference. Usually this is true, but too often the renewal of symptoms is due to cancer development upon an ulcer base. We have had this occur a number of times. The author has become a convert to the belief that cancer frequently develops upon an old ulcer scar. Graham, in 145 cases of cancer of the stomach which came to operation at our hands, found a previous history of ulcer in 60 per cent of the cases, although years may have elapsed after healing of the ulcer before the cancer began. Lebert says that 9 per cent of ulcers develop cancer, that is, pass directly from the one condition to the other. Ochsner, Futterer, Dunn, and others believe that the irritation of healed ulcer defects in the mucosa furnishes the starting-point for the majority of cancers. Murphy rightly says that precancerous lesions can usually be demonstrated in the history of the case. It is to be noted that the geography of cancer and ulcer is nearly identical.

The second proposition concerns the ulcer itself. There are two local manifestations of the malignant process upon which the advisability of operation depends,—(a) local extent of disease, (b) lymphatic involvement.

(a) Movability of the growth is a very important factor in judging of the extent of disease. Limitation to the pyloric end of the stomach is also of prime importance. Extension to

neighboring organs usually contraindicates operation, with the occasional exception of the transverse mesocolon. The duodenum is rarely involved to any considerable extent. Adhesions are a serious complication not only because they are the advance guard of the cancerous process, but in that they add to the difficulties and dangers of the operation. Haberkant found a death-rate of 73 per cent operated upon in the face of extensive adhesions and 27 per cent without such complication. Mikulicz had a mortality of 70 per cent when there was close adhesion to the pancreas. A moderate amount of adhesions which permit of free motility of the growth has not materially influenced the prognosis in our experience.

(b) Lymphatic infection. This is the most important element in the attempt at cure of cancer of the stomach because the most difficult to estimate of its extent. The mere presence of enlarged lymph nodes does not necessarily imply cancer. Glandular hyperplasia occurs with great frequency in ulcer as the result of infection, and the location of such lymph nodes may lead to the site of ulceration as pointed out by Lund. Ulcerating gastric carcinomata may give rise to infected glands without epithelial invasion, but in practically all cases of gastric cancer the lymphatic structures are involved. In the Breslau clinic, twenty cases out of twenty-one showed glandular involvement. In a general way the lymph channels follow the blood-vessels. On the lesser curvature the blood- and lymph-vessels lie in the wall of the stomach itself, and, as pointed out by Mikulicz, it is necessary in every case of pyloric cancer to remove all of the lesser curvature to the gastric artery. For convenience, this situation on the lesser curvature for the beginning of the line of excision may be called the Mikulicz point of election. We owe a debt of gratitude to Cuneo for his masterly exposition of the lymph drainage of the stomach. He showed that there are but few lymph glands along the greater curvature, and these are confined to the pyloric region. (Fig 1.) These glands, with the blood-vessels, are set at some distance from the greater curvature, thus enabling rapid expansion and contraction of the stomach, without interference with

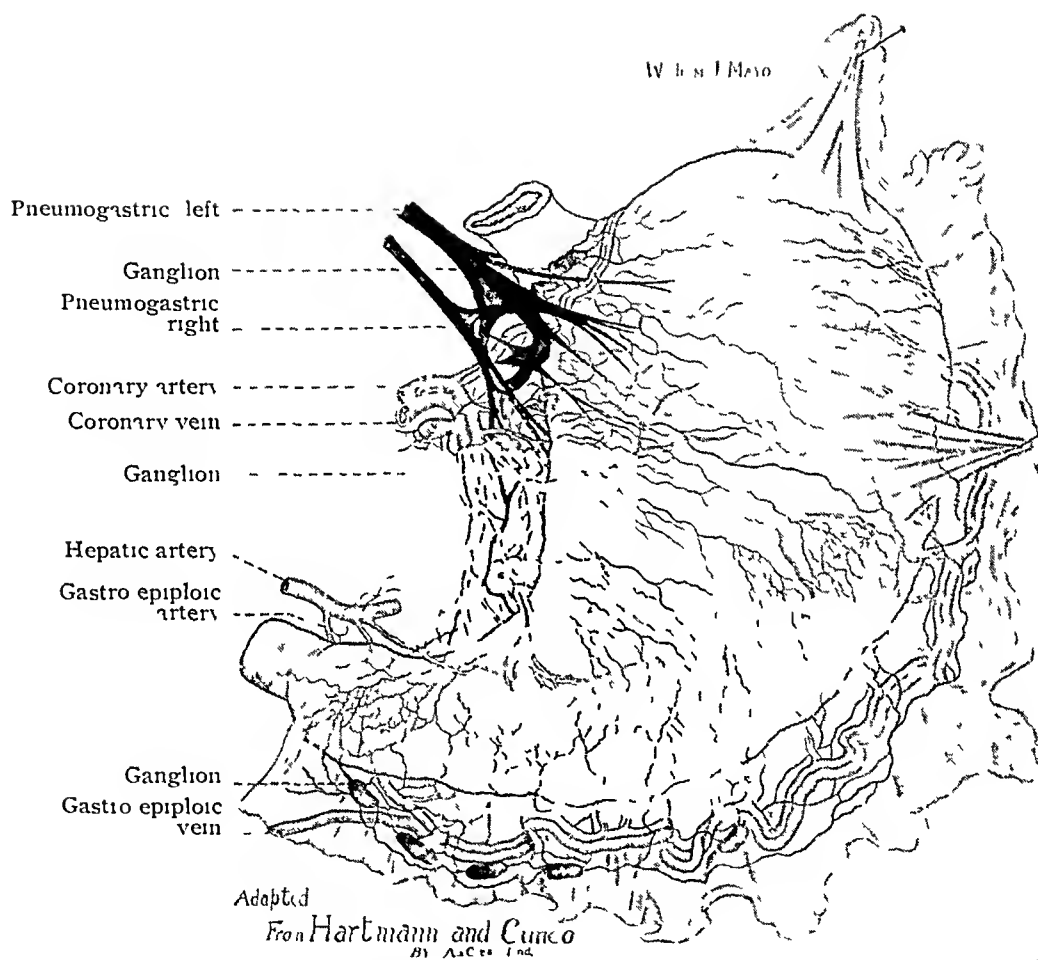


FIG 1—Showing anatomy of the stomach with especial reference to distribution of the lymphatics

the circulation. The lymph stream in this situation flows from left to right, and does not drain more than one-third of the adjacent stomach, two-thirds going into the lymph channels of the lesser curvature. In the immediate vicinity of the pylorus, however, it drains its fair share. The lymphatics of the greater and lesser curvatures enter the deep receiving glands about the coeliac axis on the anterior surface of the aorta. Cuneo practically demonstrated that the fundus and two-thirds of the greater curvature are free from lymphatic involvement in cancer of the pylorus. Hartmann at once seized upon this basic principle and fixed the point of election for the line of section upon the greater curvature at a healthy place on the gastric wall, to the left of these glands. The distance to the left is regulated by the extent of disease. In a previous communication the author called attention to the lymphatic isolation of the dome of the stomach. This has also been noted by Robson and Moynihan. It is evident that the extent of this free zone along the greater curvature is much wider in pyloric cancer than was at that time considered possible. The retention of this portion of the stomach relieves the operation of many serious difficulties without loss of completeness.

The operation itself can be divided into (*a*) Incision and exposure, (*b*) Control of hæmorrhage, (*c*) Closing of the stomach and duodenal stumps, (*d*) Re-establishment of the gastro-intestinal canal, (*e*) Avoidance of infection, (*f*) Measures for preventing shock.

The patient's stomach should be cleaned the day before rather than immediately previous to operation, as it may prove to be rather trying to one unaccustomed to the process. A small amount of liquid nourishment may be given after the lavage, but nothing on the morning of the operation. The teeth and mouth should have been previously cleansed as well as possible. A preliminary hypodermatic injection of morphine, to enable the anæsthetic to be reduced to a minimum, may be of value.

(A) A small incision is made in the median line, half-way between the ensiform cartilage and the umbilicus, through this

two fingers are introduced for exploration. If the condition is inoperable, the incision is closed, and a sufficient number of buried non-absorbable mattress sutures of silk, linen, or wire introduced into the aponeurotic structure of the linea alba to enable the patient to get about at once and to return to his friends within a few days. If sutured in the usual manner, and the patient placed in bed for two or three weeks, many of them will develop hypostatic pulmonary lesions, loss of appetite, swelling of the feet, and general debility, and may be unable to spend their few remaining days at home. When an advanced cancer case goes to bed for a week or two, the chances of his getting about again are small.

Non-absorbable sutures, buried in fixed structures such as fascia and bone, seldom give trouble, and furnish immediate strength. In muscle and movable tissues, atrophy necrosis may occur. We limit their use, however, to the hopeless cases of exploration for malignant disease. If operation is decided upon, the small exploring incision is rapidly enlarged to four or five inches, and a sufficiency of the gastrohepatic omentum is tied off at once close to the liver. This opens the lesser cavity of the peritoneum and mobilizes the pyloric end of the stomach with tumor. The entire area is now packed off with gauze pads.

(B) Control of hæmorrhage. The pyloric end of the stomach is supplied by four blood-vessels,—the gastric and superior pyloric above, and the right and left gastro-epiploics below. By ligating these four vessels early, the operation is rendered practically bloodless. The gastric is doubly tied about one inch below the cardiac orifice at a point where it joins the lesser curvature and divided between the ligatures. The superior pyloric is doubly tied and divided. The fingers are passed beneath the pylorus, raising the gastrocolic omentum from the transverse mesocolon, and in this way safe ligation behind the pylorus of the right gastro-epiploic artery, or in most cases its parent vessel, the gastroduodenal, is secured (Fig. 2). The left gastro-epiploic is now tied at an appropriate point, and the necessary amount of gastrocolic omentum

William J Mayo

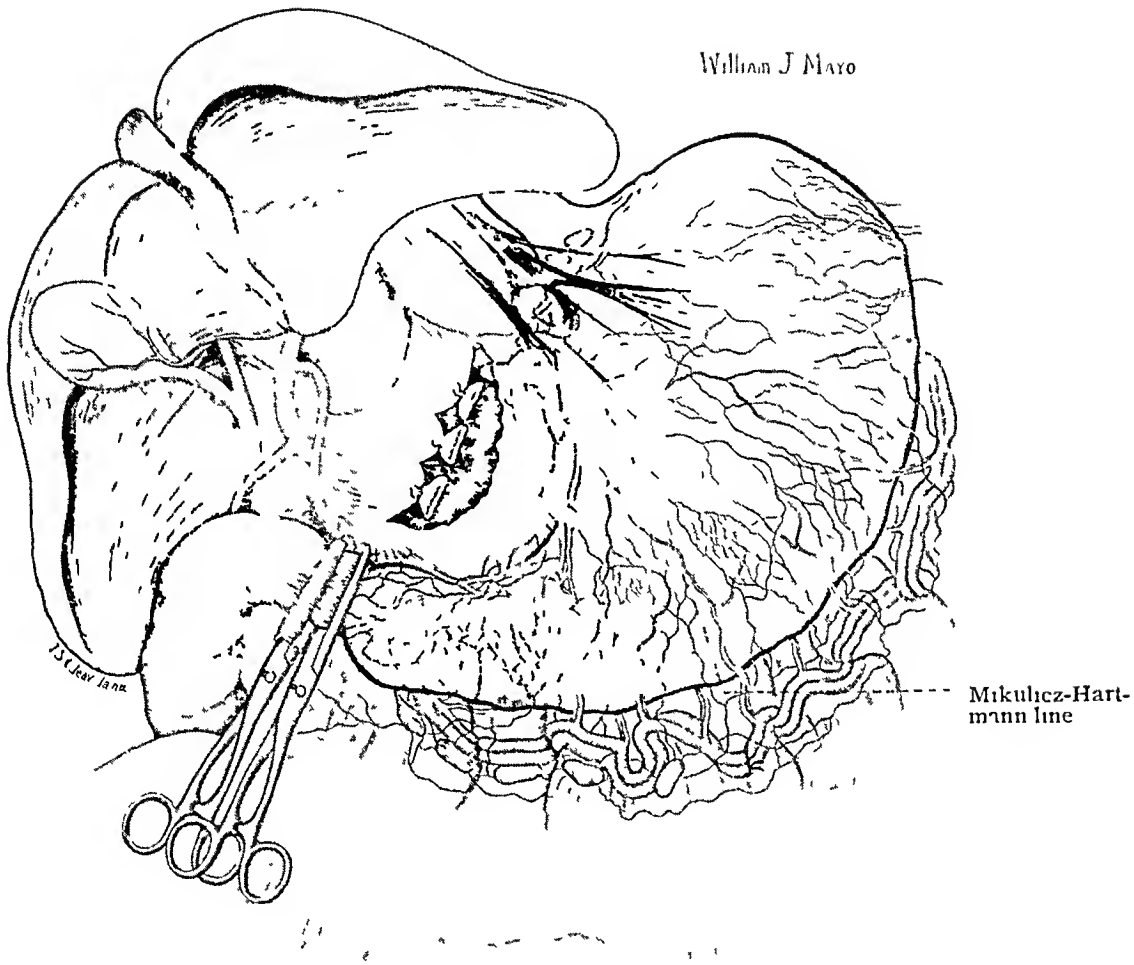


FIG 2—Showing ligation of gastrohepatic omentum and superior vessels in such manner as to leave all the lymph nodes attached to the part of the stomach to be excised also lines of division of duodenum and stomach

William J Mayo



FIG 3—Showing methods of excision. Note that all the glands on the greater curvature are removed in every case.

doubly tied and cut. Sometimes the right margin of the omentum becomes very much congested from the venous obstruction produced in this way. In a few cases it has seemed wise to excise the devitalized omentum, especially if drainage is to be used, with its attendant possibilities of secondary infection. In one such case a considerable amount of omental tissue sloughed, although fortunately the patient recovered. If drainage is not used, it will act as an omental graft and give no trouble. It is important that, in ligating the gastroduodenal vessel and the gastrocolic omentum, the fingers should raise the structures away from the middle colic artery which runs immediately beneath in the transverse mesocolon (Fig 3).

The lesser cavity of the peritoneum is a potential rather than an actual space, as the two layers of peritoneum are in contact, and the middle colic has been accidentally caught in tying the vessels from without inward. As this vessel is usually the entire supply of the transverse colon, ligation may result in gangrene of the transverse colon, as pointed out by Kronlein. This has happened a number of times. The control of hæmorrhage is very similar to the ligation of the four vessels concerned in abdominal hysterectomy and fully as easy.

(C) The duodenum is doubly clamped and divided between with the actual cautery to prevent inoculation of the cut surfaces with cancer (Fig 2). The duodenal stump should be left one-fourth inch long, and, before removing the clamp, a running suture of catgut is introduced through the seared stump and tied as the clamp is removed. A purse-string suture of silk or linen, three-quarters of an inch below the stump, enables inversion in a similar manner to the stump of the appendix (Figs 2 and 3). A long Kocher holding clamp is now placed from the tied gastric artery at Mikulicz's point of election in an oblique direction, so as to save as much as possible of the greater curvature to Hartmann's point of election on the greater curvature (Fig 3). The blades of this clamp should be covered with rubber tubing, and the compression should be just sufficient to retain the tissues in its grasp. A second clamp is applied on the tumor side to prevent leakage

The tissues between are severed with the Paquelin cautery, one-quarter of an inch from the holding clamp, and as the tissues are divided, several catch forceps are caught on the projecting stump to prevent retraction of some part of the gastric wall from the grasp of the Kocher clamp. The pyloric end of the stomach, with the tumor guarded against leakage by the clamp at each end, is removed. The cauterized stump projecting beyond the Kocher clamp is rapidly sutured with a catgut button-hole suture, from the greater to the lesser curvature, through all the coats of the stomach, and in the same manner directly back, and tied at the starting-point, this prevents hæmorrhage as well as leakage (Fig 4). The doubling of this form of suture holds the approximated edges evenly in line. The Kocher clamp is now removed and any bleeding point caught and tied.

The final suture is now introduced of silk or linen, and made after the right-angled plan of Cushing. It is taken sufficiently far from the catgut-suture line to enable easy approximation of the seromuscular layers without tension (Fig 5).

Steps (*b* and *c*) can be varied sometimes to advantage. We have frequently tied off the gastrohepatic ligament and the superior vessels, and at once double clamped and divided the duodenum. By pulling upward on the stomach side the gastroduodenal artery is easily caught, tied, and divided, and the operation proceeded with as before. In a few cases we have begun on the stomach side, ligating and dividing the gastric and left gastro-epiploic vessels first, then clamping, dividing, and suturing the stomach as before. Complete the duodenal end with its vessels last. This is favored by Hartmann. If there are adhesions, however, the first plan mobilizes the stomach much better, and enables more accurate work and greater exposure of that part of the stomach which at the line of section lies naturally deep under the costal arch.

(D) Restoration of the gastro-intestinal canal was first accomplished by Billroth, by joining directly the cut surface of the duodenum to the shortened stomach, the opening of the latter viscus being partly sutured to reduce it to the size of the

WILLIAM J. MAYO

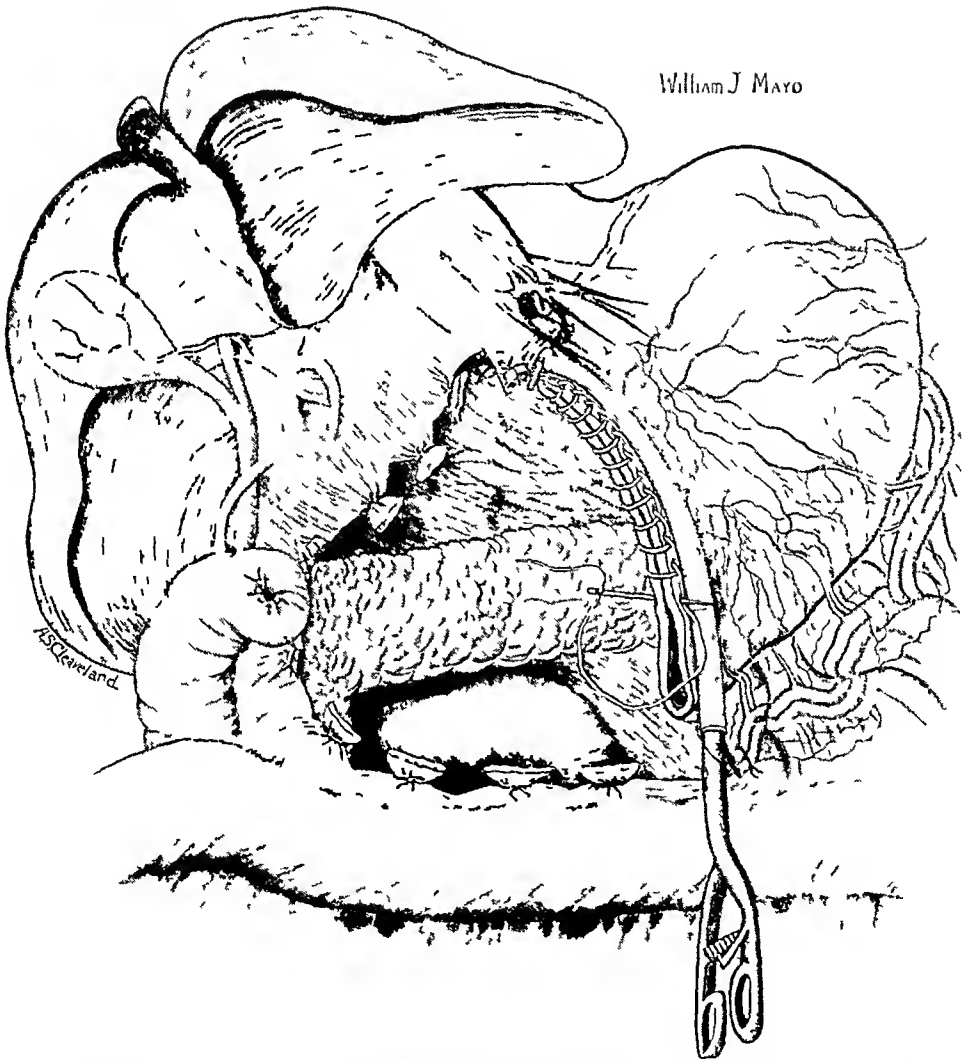


FIG 4 —Showing closure of cut duodenal end by circular suture and first row of sutures being placed on the stomach side

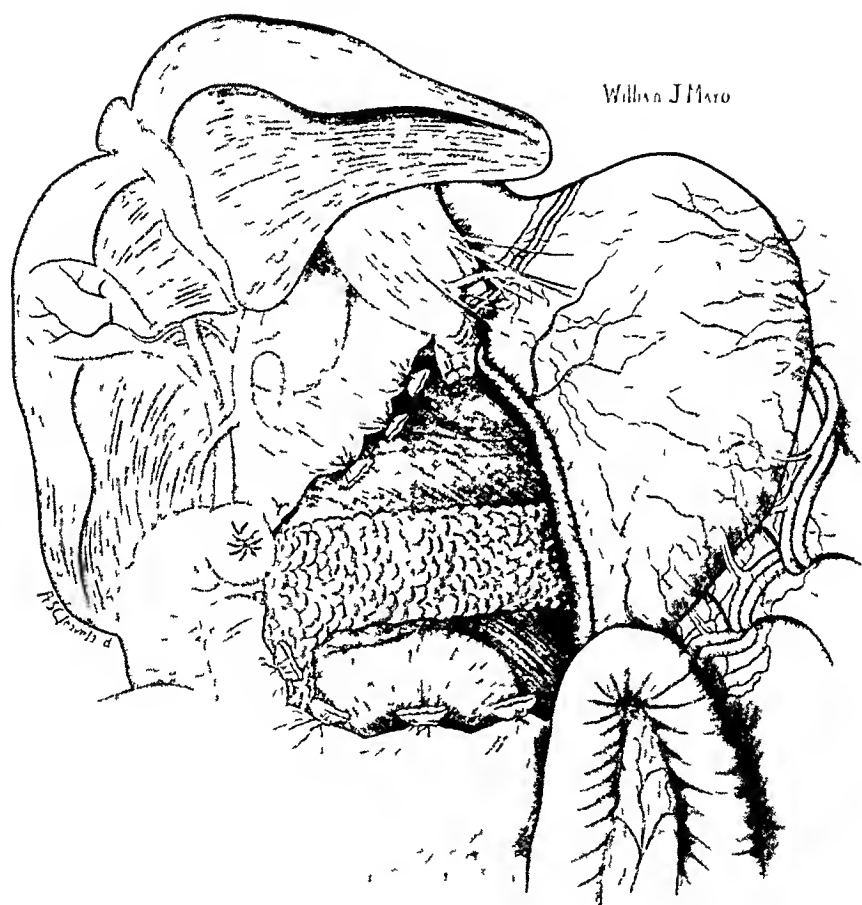


FIG 5—Showing completed operation

duodenal end The angle where the three suture lines came together leaked so often, especially if there was the least tension, that it was called the "fatal suture angle" Kocher saw the defect in this method, and began implanting the cut end of the duodenum to the posterior gastric wall at a sound point, and completely closed the stomach This method gives excellent results, if there be no tension, in bringing the parts into easy apposition Unfortunately, this often happens

Billroth's second operation is the operation of choice, complete closure of the duodenal and stomach ends with an independent gastrojejunostomy of the usual type It has the two chief requisites of gastro-intestinal anastomosis, there is no tension, and the parts to be united have not been injured Either the anterior or posterior method can be used and the Murphy button or suture operation be performed If the patient is in good condition and the operation has been completed promptly, we prefer the posterior suture method, if the patient's condition is poor, the anterior button operation is chosen (Fig 5)

(E) Infections The question of cancer infection grafted upon a raw surface is an important one We have seen carcinomatous nodes develop in the abdominal incision and in the abdominal needle punctures made in suturing the abdominal wall after partial gastrectomy Dissemination of carcinoma by rough handling or allowing infected cells to escape into the wound is not uncommon It is for this reason that all sections of the diseased part are made with the actual cautery, which prevents inoculation of raw surfaces and checks capillary hæmorrhage, and leaves the approximated ends in an aseptic condition until they are digested back to the outer suture line Pyogenic infection is prevented by the clamps placed upon each side of the excised stomach, sealing against escape of contents, while the exposed edges beyond the clamp are sterilized by the use of the cautery in making the section In addition to this the gauze pads are arranged in two rows,—an outer deep layer, which is not changed until final removal, and an inner superficial layer, which is being constantly renewed Upon

removal of the final gauze pack the entire field is carefully gone over and any little bleeding point checked by ligature. After sponging the surfaces with a moist saline gauze pad, the abdominal incision is closed. In some cases drainage seems wise on account of accidental soiling. This is seldom necessary, but if in doubt, drain, and best with a cigarette drain placed at the lower angle of the external wound, entirely away from the visceral suture lines. The internal end of the drain should reach to a situation just above the transverse colon, which acts as a dam when the patient is placed in the proper position in bed,—head and shoulders elevated. In this half-sitting posture, the little pouch formed by the transverse colon is not unlike an artificial pelvis into which any fluids gravitate. If there be but a limited area to be quarantined, the gauze should be brought out in the most direct manner possible.

(F) Shock. If the patient is in good condition, there is practically no shock, because there is no blood loss and little exposure of abdominal contents. The operation proceeds systematically, and can be done in a suitable case by the average operator, from the beginning of the abdominal incision until it is closed, in from fifty minutes to one hour and fifteen minutes. If the patient's condition is very poor, owing to early obstruction, the chief danger comes from the lack of fluids in the body. As suggested to us by Dudley Allen, this should be made up by subcutaneous infusions of saline solution, forty to sixty ounces a day, usually twenty to thirty ounces every twelve hours, for two days previous to the operation. This is continued for several days following operation, if necessary. In these dehydrated patients, it is almost impossible to get sufficient fluids into them in any other manner. For subcutaneous infusions, we prefer the ordinary Davidson syringe, to which is attached an aspirating needle. The hand-bulb enables nice regulation of the inflow. The whole can be boiled, and the infusion given by a nurse as easily as an enema. In debilitated patients very little anæsthetic is used, just enough to enable the surgeon to open and close the abdomen. All of the

visceral work can be done without pain. The previous exhibition of morphine keeps the patient from becoming nervous.

An enema of six ounces of coffee is given as soon as the patient is put to bed. If necessary, morphine, strychnine, or like remedies are exhibited.

The after-treatment is simple,—the head and shoulders of the patient are raised by four or five pillows, rectal alimentation is instituted, hot water by mouth after twelve hours in tablespoonful doses, increased to an ounce every hour. After thirty-six hours the usual experimentation with liquid foods is begun.

To recapitulate, there are six important stages to the operation as outlined.

Step 1. Open the abdomen. Step 2. Double ligate and divide the gastric artery, ligate and divide the necessary amount of gastrohepatic omentum close to the liver, leaving most of its structure attached to the stomach. Double ligate and divide the superior pyloric artery and free the upper inch or more of the duodenum (Fig 2). Step 3. With the fingers as a guide underneath the pylorus, in the lesser cavity of the peritoneum, ligate the right gastro-epiploic or gastroduodenal artery, and progressively tie and cut away the gastrocolic omentum distal to the glands and vessels up to the appropriate point on the greater curvature, and here ligate the left gastro-epiploic vessels (Fig 3). Step 4. Double clamp the duodenum, divide between with the cautery, leaving one-fourth inch projection. With a running suture of catgut through the seared stump the end of the duodenum is closed as the clamp is removed. A purse-string suture about the duodenum enables the stump to be inverted (Figs 2 and 3). The proximal end of the stomach is double clamped along the Mikulicz-Hartmann line (Fig 3) and divided with the cautery, leaving one-fourth inch projection. Suture through the seared stump with a catgut button-hole suture. This is again turned in after removal of the clamp by a continuous silk or Cushing suture (Figs 4 and 5). Step 5. Independent gastrojejunostomy (Fig 5). Step 6. Closure of the wound.

There have occurred in the hands of my brother, Dr Charles H Mayo, and myself forty-one radical operations upon the pyloric end of the stomach, thirty-seven for cancer, four for inveterate ulcer. Of these, thirteen have been made essentially by the plan outlined above, with one death. There were six deaths in the remaining twenty-eight cases, performed by various methods. In the last eleven cases this technique was used practically as given, and there were no deaths. Making all due allowance for increased experience and possibly better selection of cases, the difference is too marked to be entirely accidental. It is hardly necessary to say that this is a composite operation, and in no sense to be considered original.

In a previous contribution on this subject, published in the *ANNALS OF SURGERY* for July, 1903, a somewhat similar operation was recommended by the writer, only that it was far more extensive, removing all of the stomach excepting the dome. With increased observation and experience, the author feels the former operation, with a mortality of three deaths in eight cases, to be unnecessarily severe for the average case of pyloric cancer. The operation described at that time has a place in surgery, and should be used in the cases of more extensive disease involving the body of the stomach. In these cases it has practically all the advantages of complete removal of the stomach, and should be used as a substitute for total gastrectomy where possible. The operation herein described with a mortality of one in thirteen should be the operation of choice for the average case of fairly early disease of the pyloric region.

CONTRIBUTION TO THE SURGERY OF PERFORATING GASTRIC ULCER

BY ARCHIBALD MacLAREN, M D ,
OF ST PAUL, MINNESOTA

GASTRIC ulcer is comparatively a common disorder. Although medical treatment has been followed by an apparent cure in a majority of cases, in many instances even the rest and starvation cures have been insufficient, and many of the cured cases have relapsed, to become chronic invalids if they were not relieved by surgical measures.

Dr William J Mayo has done more than any one else in this country to impress upon us the frequency of gastric ulcer and the necessity of performing some operation to overcome the deformities of the stomach which follow, or to cure the ulcer itself.

Perforation results from the extension of either an acute or a chronic ulcer, and has been looked upon as a very rare occurrence. Extra-uterine gestation was supposed to be a surgical curiosity, but when Tait, with his lucid description, opened our eyes, we commenced to see them with great regularity. My own belief is that perforating gastric ulcer is fully as common as an extra-uterine gestation, and that when our eyes are opened to this fact, we will be able to see them, diagnose them early, and save many lives that are now lost.

The English journals of the past two years contain many records of perforating gastric ulcer. It would seem as though, through the influence of Mr Mayo Robson, the English physician is better able to diagnose these cases than his American brother. In this country, I do not believe that perforation cases reach the hospitals as often as they do abroad.

For instance, such cases as the ones described by Crisp and Fenwick, where a young girl, who had never given any marked gastric symptoms, suddenly screams, falls to the floor, soon be-

comes unconscious, and dies in a few hours. In two such cases perforative gastric ulcer was found as the cause of death at the post-mortem. No wonder such cases have never been understood. In proof of my conclusions that these cases do not reach the hospitals, Mayo reports 313 operations on the stomach and the first portion of the duodenum with only five perforations. Greenough and Joslin, in their study of 187 consecutive cases of gastric ulcer, seen at the Massachusetts General Hospital between the years 1888 to 1898, stated there were only six perforations, all of which died.

On the other side, Mr Mansell Moullin reports that between the years 1897 and May, 1902, there were admitted to the London hospital 500 gastric ulcers, of this number forty-eight, or 10 per cent, died from peritonitis and perforation.

Lebert found acute general peritonitis with perforation in 12 per cent of his own cases, and in 37 per cent of the fatal cases which he was able to collect from the literature. Dr Samuel Fenwick, consulting physician to the London Hospital, found that in 678 autopsies with open gastric ulcer up to 1900 perforation had occurred in 153 cases, or 23 per cent. Mr Moynihan, in the London *Lancet* of January, 1903, reports fifty-one perforating duodenal ulcers, most of them from the literature, and many of them in which a mistaken diagnosis of appendicitis had been made.

Moynihan's division of peptic ulcers seems particularly good. He divides perforative ulcers of the stomach and duodenum into acute, subacute, and chronic. In the acute form the opening is large, and considerable amount of stomach contents is suddenly emptied into the peritoneal cavity. In the subacute the stomach is empty or the opening is small, and consequently the peritoneum is slightly soiled. In the chronic form the opening is walled off by adhesions.

All authorities agree that, whereas gastric ulcers are more common on the posterior wall, acute perforations are usually on the anterior surface. The posterior ulcers are more frequently chronic in their method of perforation, leading to the formation of subphrenic abscess.

The premonitory symptoms of perforating ulcer are usually well marked. There are the ordinary symptoms of gastric ulcer, local tenderness, and pain after eating, in a spot just below and a little to the left of the ensiform cartilage, or in a corresponding point in the back, belching of gas, sometimes hæmatemesis or melæna, some or all of these symptoms existing for a few days or for several months.

In a certain considerable proportion of cases, however, all premonitory symptoms are lacking, and this is often true in the most acute perforations with either acute or chronic ulcers, especially if the ulcer is well up on the anterior surface near the lesser curvature, the so-called latent gastric ulcer of Robson.

The immediate symptoms of acute perforation are, first, sudden, agonizing, overwhelming pain in the region of the stomach, something tearing in character, often with the sensation of something having given away. This pain is frequently so intolerable that the patient falls to the ground, and even may become unconscious, as in the cases described above. The pain rapidly spreads, following the gastric contents to other parts of the peritoneal cavity. If the perforation be near the pylorus or in the duodenum, the stomach contents flow over the hillock of the right transverse mesocolon into the right kidney pouch, and from there into the right iliac fossa, which accounts for the fact that many of these cases are diagnosed as appendicitis. Rigidity and tenderness of the abdomen soon follow, together with profound collapse. The absence of liver-dulness is a symptom upon which some authors place considerable reliance, but if the stomach does not contain considerable gas at the time of the perforation, the liver-dulness will not be changed.

My experience leads me to believe that Dr. Richard Harte, of Philadelphia, is correct when he says that rigidity or tension of the abdominal muscles is the key-note to the early recognition of peritoneal perforation from whatever source. The pain may subside, the temperature may not be elevated, but the rigidity continues even up to the end.

Vomiting is seldom present with perforation, wherein these cases differ from acute peritonitis from other causes, the prostration and collapse are well marked, the pulse is weak at first, and frequently becomes dichrotic and small, and the other symptoms are the well-known evidences of a very acute general peritonitis

The symptoms of subacute or chronic perforations are naturally not so well marked. But in the main they are the same as in acute cases, only milder and slower to develop. Often they will simply be the symptoms of a local peritonitis or of an intraperitoneal abscess located near the stomach

In making a diagnosis of perforating ulcer, we should, first, carefully distinguish between commencing inflammations above the diaphragm and any disorder below. We must remember that occasionally an acute pleurisy or pneumonia may in some degree resemble a perforation in the upper abdomen

As between the different intraperitoneal inflammations or accidents which may be mistaken for perforation, the differential diagnosis is not so important, and is perhaps frequently impossible. Lund and Fitz, of Boston, believe that the differential diagnosis is not possible between this condition and an acute pancreatitis or perforation of the biliary passages

Mr C B Keetley says that certainty of diagnosis in most cases of gastric perforation is impossible even with experienced persons, but that "it is not necessary," and he further says any physician who, in the face of such symptoms as these which I have already described, wastes valuable time in the attempt to make an accurate diagnosis is almost criminally responsible for the death which is sure to follow. For example, Mr Bidwell recently collected fifty-five cases of perforating ulcer, in this list most of the cases operated upon in the first twenty-four hours recovered, after that time the great majority of the cases died

Personally, I believe that many of these cases can be correctly diagnosed, as is proven by a few cases which I here report, and the many cases which are constantly being published in the journals. If we will only rid our minds of the old idea

that these cases are rare, and will appreciate that they are not uncommon, we will not miss them so frequently.

What is the duty of the medical man when he meets such a case? My answer would be to first give the patient morphine, that will be necessary on account of the terrible pain which these patients suffer during the first few hours, and then without delay have him transported to the nearest hospital, lying in a wagon or on a cot in the baggage-car, or in an ambulance if one is to be had. This should be done because these patients have a much better chance of recovery in a hospital, despite the transportation, than they would if operated upon in a private house.

The secret of success in treatment of acute perforations is an operation at the earliest possible moment, followed by suture of the opening with silk or linen or caulking the opening with gauze. Sponging if the peritoneum is slightly soiled, without drainage, but if a considerable amount of fluid is found in the peritoneal cavity, a large-sized drain should be put into the pelvis through a stab wound over the symphysis, and the patient be put to bed in the Fowler position.

CASE I—*Perforating Latent Gastric Ulcer on the Anterior Wall, Operation Eleven Hours after Perforation, Recovery*

F M, aged thirty years. Six years ago he had what was supposed to be tuberculosis, followed by some slight hæmorrhages and faint spells, referred to the stomach, which were relieved by eating something or taking a teaspoonful of whiskey. These symptoms lasted for about one year, when he entirely recovered. For the past four days he had suffered from some slight gastric distress, and was dieting himself. He was working on his farm in Southern Minnesota at 10 A M, June 3, when he was suddenly seized with such severe pain over the stomach that he fell to the ground. One hour later he was seen by Dr. Frazer, of Lyle, who made a diagnosis of "some serious intraperitoneal accident." He immediately put this young man on a cot and got him on to a train which was just leaving for St. Paul. I first saw him at 8 30 P M, and made a guarded diagnosis of perforative ulcer of the stomach, on account of the history and the large quantity of

fluid which had evidently been passed into the peritoneal cavity. Still, as the pain was most intense in the pelvis when I saw him, I made an exploratory opening over the appendix for drainage. When I found that the appendix was normal and that the abdominal cavity was filled with a thin, turbid, watery fluid, I immediately made a stab wound over the symphysis and put in a large-sized aluminum tube, also tube and gauze in the McBurney's X-muscle incision. I then made an opening over the stomach and found without any difficulty a perforation on the anterior wall nearer the lesser curvature and two inches from the pylorus, the opening being about the size of a pea with slightly thickened edges. The opening was easily and quickly closed with a silk purse-string suture. One end of a small gauze strip was folded down over the opening and was caught with a catgut stitch.

The patient was put to bed in the Fowler position, sitting almost completely upright, tied to a bed-rest. He kept this position from choice for several days, finding that he was more comfortable while sitting upright than when he was lying down. All the drains were removed on the fourth day and he made a prompt and rapid recovery. He reached home in less than a month, and has remained perfectly well, attending to his business as a farmer and banker for the past six months.

Dr Frazer writes me that our patient is in the best of health, can eat anything, but that he has the worst breath that he has ever come in contact with.

CASE II—Probable Perforating Gastric Ulcer, Death in Twenty-Nine Hours without Operation or Post-Mortem

While Case I was still in the hospital, Dr Cameron, the house surgeon, went to Rush City for a few days to help Dr Stowe of that place. Together they saw Miss M, who had been a constant sufferer from anæmia, with attacks of indigestion off and on for a year and a half. This young woman was out working in the garden, when at 11 A.M. she was suddenly seized with the most acute and agonizing pain over the stomach, and became collapsed.

Dr Stowe saw her two hours after the accident and gave her morphine for her pain, but was not able to make a diagnosis, but suspected ruptured extra-uterine gestation. The next morning Dr Stowe and Dr Cameron saw this woman together, she had a rapid, weak pulse, and was suffering great pain and dyspnoea.

Her abdomen was hard and rigid, especially in the upper portion, while the lower abdomen evidently contained fluid in considerable quantity

I was called to see her, but did not reach Rush City until just as she died at 4 P M It was not possible to get a post-mortem examination in this case, so the absolute diagnosis is impossible Her history is very suggestive to me

CASE III—*Subacute Perforating Gastric Ulcer, Operation Nine Hours after Perforation, Recovery*

E H, a young man twenty-seven years of age, had never suffered from any severe illness, but for the past two years he had some indefinite stomach distress For the past ten days he had suffered from a more pronounced pain in the stomach, but not enough to cause him to consult a physician or to stop work His pain was fairly constant, being relieved for a couple of hours after eating His appetite was poor, and he was afraid to eat much but liquids

At 11 30 A M, on September 2, 1903, he was working at a bench, he suddenly had the most intense pain over his stomach and dropped to the floor My partner, Dr H P Ritchie, who had assisted me with Case I, was called to see him He made the absolute diagnosis Dr Rothrock, of St Paul, was their regular physician, so he was called upon to operate upon this case He found a chronic ulcer on the anterior wall of the stomach one inch from the pylorus, in the cavity of which was a minute perforation about the size of a pin's head exuding mucus and gas The opening was closed, the peritoneum sponged, and closed with a cigarette drain, the patient promptly recovered

Here are two proven cases occurring in the practice of Dr Ritchie and myself in three months, with one probable case during the same length of time, which makes me feel that perforative gastric ulcer is not a very uncommon disease, and that probably other cases of acute peritonitis which I have seen in the past were due to this same cause My previous experience with perforating gastric ulcer is confined to two cases, one operated upon ten years ago, for what was supposed to be a perforative appendicitis, on the third day A large abscess in the pelvis was opened and drained The man lived thirty-

six hours The post-mortem examination revealed an opening as large as a silver quarter, well up on the anterior surface of the stomach, with thickened edges The second case, June, 1901, immediately followed a supravaginal amputation of the uterus for an old suppurative disease of both appendages In this case I had introduced the gloved hand and explored the upper abdominal cavity without being able to make out any diseased condition The operation was immediately followed by an acute peritonitis, which was supposed to be due to the hysterectomy At the post-mortem we found a chronic ulcer low down on the posterior wall of the stomach with an opening which would just admit the tip of the little finger

CIRRHOSIS OF THE STOMACH.

BY JOHN G SHELDON, M D ,

OF TELLURIDE, COLORADO,

Surgeon in Charge of the Miners' Union Hospital

MR H C , fifty-two years of age, came to me, December 1, 1902, complaining of severe pain in the abdomen, vomiting, and inability to eat or drink His previous symptoms were as follows

He was perfectly well until he reached his thirty-eighth year, fifteen years ago From this time his symptoms can be divided, for description, into four periods From the thirty-eighth to the forty-fifth years of his life he was troubled, at intervals, with "sourness of the stomach, occasional vomiting,—sometimes in the morning and oftentimes after meals, poor appetite part of the time, dull pain in the abdomen, belching of gas at intervals, and a coated tongue most of the time" These symptoms had slowly progressed in severity Their inception was so gradual that the patient was unable to determine definitely the time that he first noticed them, but they gradually annoyed him more and more, so that when he was forty-five years of age he felt well only at short intervals

During the next four years, from his forty-fifth to forty-ninth years, his symptoms were gradually becoming more severe, but he had continued to work on his farm During these eleven years of suffering he had received no treatment, neither had he taken medicine of any kind

During the last three years of his illness, he was unable to work on account of weakness and suffering The pain in his abdomen was nearly always present Usually it was a "dull, gnawing pain in the pit of his stomach," but sometimes he would have severe paroxysms of pain that would require morphine to relieve them The pain was always in the median line of the abdomen above the umbilicus It never seemed to be located in a small area, and never radiated Ingestion of solids or liquids increased the severity of the pain Vomiting sometimes, but not always, gave him partial but not complete relief So far as he

knew, pressure on the abdomen did not diminish or increase his suffering

Next to pain, vomiting was his most distressing symptom. He always vomited after eating solids, and frequently he was unable to retain liquids. Sometimes he would vomit immediately after eating, again, two or three hours would elapse before emesis occurred. He had frequently noticed that he would vomit food that he had eaten forty-eight hours previously. This puzzled him very much. He was at a loss to explain how he could vomit several times, and then, after ten or twelve hours had elapsed, succeed in bringing up material that had remained in his stomach during four or five previous attempts at vomiting. At no time had he ever vomited blood.

The symptoms that he complained of, other than pain and vomiting, were as follows:

His appetite was always good till the last year of his illness. During this time he was never hungry, and when he forced himself to eat, his food seemed without taste. At times he would crave certain articles of food. On one occasion he sent twenty miles for fresh onions, and when they came a taste of them was all he could eat.

His general condition remained fairly good, although he was progressively losing in weight and strength. His bowels were usually constipated but responded to cathartics. Copious evacuation of the bowels did not relieve the pain or vomiting. The treatment that the patient received during the last three years of his illness was as follows:

The first year was taken up with experiences with the local profession. The diagnosis was invariably chronic gastritis, and the internal administration of sodium bicarbonate and elixir of iron, quinine, and strychnine phosphates fairly represents the treatment. After trying these methods for one year, he went to one of the larger Western cities and consulted a "specialist." He remained in the city one month, having gastric lavage performed daily. After returning home he remained on a liquid diet for three months. During this time he felt better, but gradually the liquids gave him much distress and he could no longer retain them. He gave various patent remedies a trial for a few months, and then went to one of the larger Eastern cities for treatment. Here a diagnosis of gastric ulcer was made and

rectal feeding resorted to for three weeks. During this time he improved. He had very little pain, did not vomit, and seemed to gain in strength. He returned home believing that he would now get well. As soon as he began to eat, the old symptoms immediately returned. By this time the patient was very weak and considerably emaciated. He again applied to the local physicians for treatment, and it was through them that I saw him in consultation. At this time he vomited everything that he took into his stomach with the exception of small quantities of hot water.

Examination—The patient was a well-developed but extremely wasted and anæmic man of fifty-two years. His skin was dry and somewhat darkened, but he was not jaundiced. Examination of the thoracic contents revealed nothing abnormal. The lungs showed only evidences of a chronic bronchitis. The heart was not enlarged or displaced. A systolic murmur was heard over the pulmonic area. The peripheral arteries were somewhat sclerosed. Otherwise, the circulatory system was normal. The abdomen was not distended or rigid. The epigastrium was tender on deep pressure. No masses or points of tenderness were found. Examination of the liver was negative. The spleen could not be palpated. Rectal examination revealed nothing abnormal. Examination of the lymphatic and nervous systems was negative. Gastric lavage was performed after giving a test meal. The result of the examination was as follows:

Acid reaction

No hydrochloric acid found

Organic acids present

No Boas-Oppler bacilli found

It was found that only a very small quantity of water could be passed into the stomach. When more than six or eight ounces were used, the patient would retch violently and expel it. Inflation of the stomach with carbon dioxide was quite puzzling to me. I had expected to find the organ dilated. But when the stomach was filled with gas its outline could not be determined by external examination.

Examination of the urine was negative. The blood examination was as follows:

Red cells, 2,800,000

Leucocytes, 5800

Hæmoglobin 48 per cent

Stained specimens showed a few nucleated reds, but no fragmentation of the cells was seen. The eosinophiles were not abnormally increased in number. The proportion of the polynuclear to the mononuclear leucocytes was normal.

A positive diagnosis was not made at this time. A stenosis of the pylorus seemed probable, but the absence of a dilated stomach made me cautious in making this diagnosis. Malignant disease was seriously considered. The examination of the stomach contents did not contradict this diagnosis, and a physical examination would not exclude diffuse carcinoma of the organ. The family history regarding malignant disease was negative. Rectal feeding was advised for a period of three weeks as a diagnostic aid and as preparatory treatment for operation. During this time the stomach was frequently washed out and its contents examined. The only variation noted by the examinations was the gradual diminution in the quantity of organic acids. When the patient took nothing by mouth, he was practically free from pain and did not vomit. He retained the nutrient enemata well, and gained strength while being nourished in this manner.

A probable diagnosis of benign stenosis of the pylorus was made and operation advised. On the 3d of January, 1903, the patient was given two ounces of castor oil. He retained this, and in a few hours had several evacuations of the bowels. The stomach was washed thoroughly with sterile water on the night of January 4, and the process repeated the next morning, at which time the operation was performed. Ether was used as an anæsthetic, preceded by one-quarter of a grain of morphine and one hundred-and-fiftieth of a grain of atropine given hypodermically. A median incision was made in the epigastrium. The stomach was not deformed, but was very small. It did not measure more than two inches in its greatest transverse diameter, nor more than six at its longest part. The external surface was smooth and no adhesions were present. The stomach appeared perfectly normal on its outer surfaces, but was extremely diminished in size. It felt firm, elastic, and resistant. It seemed to be of a uniform consistency, with the exception that the pylorus, and the portion of the stomach next to it, was more firm than the remainder of the organ. No enlargement was felt in the region of the pancreas. The gall-bladder was not distended, and no

solid masses could be detected by palpating it. The liver seemed normal. The appendix was brought into the wound, but showed no abnormal changes. The spleen was not examined. A gastro-enterostomy was done with a Murphy button. A transverse opening was made in the small intestine about sixteen inches from the point where the duodenum passes under the superior mesenteric artery. The opening in the stomach was made on the anterior surface, parallel to the smaller arteries of the stomach (that is, at right angles to the greater curvature) and in the very lowest part of the organ. The stomach wall was at least one centimetre in thickness. It cut with resistance, and the cut surface looked like fibrous tissue. So far as could be determined, the gastric mucosa was smooth and atrophic. The size of the pyloric opening could not be determined, but it must have been very small. The omentum was sutured to the stomach, over the anastomosis, with catgut. The abdominal wound was closed in layers with catgut and silkworm gut.

The operation was attended with little shock. The patient was propped up in bed as soon as he had recovered from the anæsthetic. Nothing was given by mouth for three days, then small sips of hot water were given at frequent intervals. After the twelfth day liquid food was given by mouth and borne by the patient without discomfort. The button was passed on the thirteenth day. On the eighteenth day the patient was allowed to eat solid foods. Since that time he has eaten everything and anything that he desired, and has experienced no trouble with his stomach in any way. He has never vomited since the operation was performed, neither has he suffered from pains or gaseous eructations as he formerly did. Three months after the operation was performed, he had gained thirty-six pounds in weight and felt well and strong. The patient tells me to-day (November 18, 1903) that he has worked on his farm all summer, that he has suffered none with his stomach, that he eats well and relishes his food, and that he weighs as much as he did when he was thirty years old.

From the history of this case, both before and since the operation was performed, I have come to the conclusion that this was a case of benign sclerosis of the stomach and that the patient is free from malignant disease.

It has been a much discussed question whether a non-malignant cirrhosis of the stomach exists. I think that the preponderance of the evidence demonstrates to us clearly that while it may be at times difficult, or even impossible, to distinguish between a diffuse carcinoma of the stomach and a cirrhosis ventriculi, still, in rare instances, a benign cirrhosis of the stomach does occur. Andral,⁴ Cruveilhier,⁵ Brinton,⁶ Habershon,⁷ Wilks,⁸ and most of the earlier writers, have clearly drawn the distinction. The evidences on which their opinions are based, it must be admitted, were imperfect. However, the opinions of so many close clinical observers are not without their weight in this matter. Most of the recent writers give the condition recognition, but their statements are brief and in no way convincing. Einhorn¹ makes the positive statement that a benign cirrhosis of the stomach does occur. Osler² recognizes the condition and reports one characteristic case. Hemmeter³ states that the pylorus may be the seat of a hypertrophic stenosis, and that in rare instances the entire stomach may be involved in the hypertrophic process. Leith^{4a} recognizes the condition and discusses it at some length. He has observed one case, and mentions a case seen by Dr. Clifford Allbutt.

Most German writers contend that a diffuse benign cirrhosis of the stomach does not occur. They maintain that all of these cases are carcinomatous. Bret and Paviot⁹ share the same opinion with the Germans. They state that their opinion is based on the condition of the perigastric glands in their cases. They admit that no evidence of carcinoma was found in the stomach walls themselves, but in the same case the lymphatic glands gave evidences of cancerous involvement. I am unable to find a detailed report of their cases, neither do I know the number of cases they have reported.

G. B. Hunt reports a case of diffuse carcinoma of the stomach, and is of the opinion that cases of diffuse thickening and contraction of the organ are malignant. He does not refer to any proof for his belief with the exception of the report of one case.

I am of the opinion, from observing the case herewith reported and from examining the reports of others, that a benign diffuse cirrhosis of the stomach, though a rare condition, does occur. Of course, it is possible that a carcinomatous process may develop in a stomach already the seat of chronic cirrhotic changes, but, as will be seen from the pathology of the conditions, that will be discussed later, it is improbable that such a case has been recorded. Before discussing the condition in general, I shall give the reports of the cases that have been recorded.

CASE I—*A Case of Extreme Contraction of the Stomach* (W B Hadden, *Transactions of the Pathological Society*, 107, London, 1891)

A woman, thirty years of age, suffered from epigastric pain and vomiting for ten months. During the last three months of her illness she was obliged to nourish herself with liquid food only, which she took very slowly. She was very weak and greatly emaciated. During the last month of her life she refused to take food of any kind, and during this period she vomited very little.

Post-mortem—The stomach was tube-like in shape and was only four and one-half inches long. It is stated that its circumference measured only one inch. The stomach walls were one-half inch in thickness. The first two inches of the organ, joining the œsophagus, were roughened and ulcerated. The remainder of the lining of the stomach was smooth, white, and firm. Microscopical examination showed that the mucosa had disappeared. There was found great fibrous thickening of the submucosa. It is described as presenting an "open-textured" appearance that suggested œdema. The muscular and serous coats were described as being normal. No signs of malignancy were found, and no etiology for the condition could be determined.

CASE II—*Fibrous Contraction with Hour-glass Stricture of the Stomach* (F C Turner, *Transactions of the Pathological Society*, London, 1887)

A man, sixty years old, suffered from dyspepsia for one month. Then vomiting occurred, he became greatly emaciated, and died at the end of three months.

Post-mortem—A tight stricture was found two inches from the pylorus, which did not admit a glass rod about one-eighth of an inch in diameter. The stomach was much contracted and its walls greatly thickened and fibrous, especially along the lesser curvature. The mucosa showed many superficial ulcerations along the lesser curvature from the point of stricture extending towards the cardia. On the anterior wall of the stomach, a short distance from the stricture, there was a chronic ulcer the size of a shilling. The mucosa was seamed with interlacing fibrous tracts. The peritoneal covering of the stomach was roughened.

by many loose, fibrous adhesions. No other abnormal lesions were found in the abdomen. The author says that while contractions of the stomach resembling this one often result from ulcerations, that so extended a lesion as the one he reports cannot be due to the results of gastric ulcers. He thinks that the interlacing fibrous tracts in the mucosa were probably due to fibroid degeneration of an irritative growth of the connective tissue of the submucous layer, and that this was associated with a general thickening of the gastric walls. He believes that the superficial ulcerations were secondary. He makes no mention of malignancy being present.

CASE III—*Etude sur la Gastrite Chronique avec sclerose sous-muqueuse hypertrophique et retroperitonite calleuse* (Victor Hanot and Albert Gambault, *Archive de Physiologie*, 1882)

A woman, forty-four years old, and an alcoholic, entered Guy's Hospital complaining of abdominal pain and tympanites. Examination showed some ascites. Three weeks later the patient developed a general peritonitis and died.

Post-mortem—The peritoneum was thickened, the liver was enlarged, and a considerable quantity of free fluid was found in the peritoneal cavity. The stomach was small, hard, and thick, and was described as being like a rubber ball. On section of the stomach it was observed that its walls were very thick. It is stated that they measured one inch in thickness near the pylorus. The microscope showed that the thickening was due to hypertrophic changes in the muscular and submucous coats. These layers were found to be of equal thickness. The submucosa was very resisting, and had a dull, white appearance. Malignant disease was not considered by the reporters of this case.

CASE IV—A woman, thirty-three years old, had complained of dyspepsia for four or five years. She had been a worker in straw-hat factories, and had the habit of pressing the handle of the iron with her abdominal wall. Her greatest complaint was vomiting. This gradually became more severe, but at intervals of several months she would not vomit at all. During the last two years, however, she vomited several times every day. She complained of severe pain in the epigastrium at times. Examination showed the presence of an egg-sized tumor in the region of the stomach. This was freely movable. The patient died from weakness and lack of nutrition.

Post-mortem—The stomach was small and would hold only four or five ounces. Its walls were from three-quarters to one and one-half inches in thickness. The tissue of the stomach was moderately firm in consistency and showed no trace of a neoplasm. The mucosa was smooth and atrophic and showed no ulcerations. The tumor mass, felt before death, was situated in the submucous tissue, and microscopically was found to consist of imperfect fibrous tissue and some granulation tissue. There was absolutely no evidence of carcinomatous development. The remainder of the submucosa of the stomach showed a great increase of the fibrous elements, but no signs of carcinoma were found.

CASE V—A man, forty-five years old, showed marked cachexia when first seen. His abdomen was distended and some ascites present. He

said that he had been sick one year, complaining of cough, bleeding from the lungs, pains in the stomach, and loss of appetite. He gave no history of having vomited.

Post-mortem—The stomach was diminished in size and was adherent along its lesser curvature. The gastric wall was thickened, being from one to two centimetres in thickness near the pylorus. The stomach tissue was indurated and firm. The mucosa was smooth, pale, and indurated. Microscopically, there was found hypertrophy of the muscularis and great fibrous increase of the submucosa. The mucosa was atrophic and showed considerable loss of glandular structures.

CASE VI—*Progressive Contraction of the Stomach with Gastric Hypertrophy* (Dr Jacobi, *New York Medical Record*, Vol xvii, 1880)

A man, sixty-two years of age, formerly addicted to gluttony, said that he had been vomiting continuously for six months. He remarked that he rejected ingesta, in an unaltered condition, fifteen minutes after eating. He was markedly emaciated.

Post-mortem—The stomach was small and was shrunken to the size of a loop of large intestine. Its walls were much thickened, but in places showed areas of marked attenuation. Many small cicatricial areas were found in the mucosa near the cardia.

(No report is given of further examination in this case.)

CASE VII—*Caso di notevole crosi dello stomaco in soggetto non bevitate* (A marked case of gastric cirrhosis in a non-drinking subject)

Bollettino di sezione di cultori di scienze mediche e r Accademia di fisiocritici di siena, Vol v, 1887. Reported by C Bernabei.

A man, sixty-three years of age, experienced great difficulty in swallowing solids. He vomited frequently, experienced great pain in the abdomen at times, and suffered from constipation. He became greatly emaciated and died one year after the beginning of his illness.

Post-mortem—The stomach was greatly reduced in size. It would hold about 100 centimetres. The greater curvature measured about twenty-five centimetres, the lesser curvature seven centimetres. The distance from the greater to the lesser curvature was seven centimetres. The anteroposterior diameter of the stomach was seven centimetres. The circumference of the pyloric orifice was seven centimetres, that of the cardiac five centimetres. Nothing is said concerning the microscopic findings in this case.

CASE VIII—Osler ("Practice of Medicine," page 467) mentions a case of cirrhosis of the stomach studied by himself and Henry. I understand that the report of this case was published in Montreal some years ago, but I am unable to obtain it. Osler makes the following statements: "The greater portion of the lining membrane of the stomach was converted into a perfectly smooth, cuticular structure, showing no trace whatever of glandular elements, with enormous hypertrophy of the muscularis mucosæ, and here and there formation of cysts."

CASE IX—R F C Leith^{4a} mentions a case of cirrhosis of the stomach in which the involvement was diffuse and carcinoma improbable.

Microscopic examination showed beyond all doubt that the condition was not malignant

CASE X—Leith mentions a case observed by Clifford Allbutt¹⁰ that was non-malignant. In this case, Allbutt believed that the cicatricial process had its starting-point in the healing of gastric ulcers. The stomach was much contracted, but was diffusely involved. The patient ultimately died of pyloric stenosis.

PATHOLOGY—The Size and Shape of the Stomach—In all of the cases the stomach was much diminished in size. In one case, that reported by Bernabei,¹⁶ its capacity was estimated at 100 cubic centimetres. In all of the cases but one the stomach had retained its normal shape.

Thickness of the Stomach—The walls of the stomach were uniformly thickened. In only one case was the thickening irregular. In the case reported by Jacobi,¹⁵ many small areas were present in which the stomach showed marked thinning. In all of the cases, the thickness and induration of the organ was most marked in the region of the pylorus. The organ showed less evidence of involvement in the cardiac region. In all of the cases the entire organ was involved.

Peritoneum—The covering of the stomach appeared normal in all but two cases. In two cases, reported by Hanot and Gambault,¹⁴ the peritoneum was thickened, and adhesions, and evidences of a chronic inflammation, were present.

Muscular Coats—The muscularis of the stomach showed abnormal changes only in one case. Hypertrophy of the muscle was present to quite an extreme degree in one case reported by Hanot and Gambault (Case III).

Submucosa—In all of the cases the submucosa was markedly thickened, indurated, and showed marked increase in the fibrous elements. The muscularis mucosa was in every instance thickened and fibrous.

Mucosa—In all of the cases the lining of the stomach was smooth, white, firm, atrophic, and indurated. The glandular elements were much altered, and in most instances had nearly disappeared. In one case reported by Turner¹³ the mucosa was not entirely smooth, but was seamed in places.

Relation to Ulceration —Allbutt states that he is of the opinion that the cicatricial changes observed in his case were the results of gastric ulceration. He does not discuss the subject in detail, neither does he attempt to explain the process. In the case reported by Turner,¹³ a single ulceration was found the size of a shilling. Turner believes that this ulceration was secondary and had nothing to do with the primary cicatricial process.

Relation to Cancer —From studying these cases, one would believe that cirrhosis of the stomach was not associated with cancer in any way. Many writers do not concede this. The position taken by Bret and Paviot⁹ has been stated. They are of the opinion that these cases are all malignant, but they give no positive proof for their statements. Mathieu¹⁹ believes that there is a close relation between cicatricial changes of the stomach and carcinoma. He says that "Interstitial gastritis with atrophy is commonly associated with carcinoma. Interstitial gastritis and cancer go side by side or follow one another, just as in certain cases of primary cancer of the liver nodular carcinoma and cirrhosis develop simultaneously or successively." Mathieu's statements may be perfectly correct, but he brings no evidence that in certain cases cirrhosis of the stomach may be unassociated with malignant disease. In my mind, there are cases of cirrhosis of the stomach in which the condition is sufficiently severe to terminate the life of the patient, and no carcinomatous involvement be present.

ETIOLOGY —The Nature of the Condition —I believe that the ten cases herewith reported are sufficient evidence to warrant us in considering cirrhosis of the stomach as an independent condition not associated with carcinoma. This statement will doubtless be objected to by some. I have no doubt that carcinomatous tissue might be present in some of the specimens that correspond, clinically and anatomically to cirrhosis of the stomach. Such a case has been reported by Hunt¹¹. On the other hand, it is just as possible that similar cases to the one reported by Hunt were not malignant at all. The presence of

glandular elements beneath the muscularis mucosa does not in itself mean carcinoma of the stomach. A quotation from Leuk¹⁷ is of interest in this connection. "For an absolutely certain diagnosis of carcinoma from small pieces of stomach mucous membrane, we must prove an atypical epithelial proliferation from the mucosa into the submucosa. Glands in the submucosa even without mitotic figures must not necessarily be the result of carcinomatous proliferation. Accessory Brunner glands in the pylorus, or simply ends of glands that have been cut off by a branch of the hypertrophic muscularis mucosæ, as I have often seen it in complete sections, might simulate a carcinoma."

Age—The cases occurred in patients who were from thirty to sixty-three years of age. The average age was about fifty. Men and women were about equally affected. The women, as a rule, suffered from the conditions at an earlier age than did the men. We know little, if anything, concerning the etiology of this condition. Brinton⁶ supposed that alcohol was the most prominent factor in the production of cirrhosis of the stomach. The reports of the cases are not in accordance with Brinton's belief. Only one patient (one described by Hanot and Gambault¹⁴) was an alcoholic. Congenital predisposition might be considered of importance in producing the condition. The pathologic changes found in cases of congenital stenosis of the pylorus are similar to those observed in the cases herewith reported. The report of a case of congenital hour-glass stomach in a foetus, by Sandifort,²⁰ is of interest in this connection.

From the reports of the cases, it is probable that cirrhosis of the stomach, when it does occur, is in the great majority of instances unassociated with other diseased conditions. Cicatricial changes in the liver, spleen, or kidneys were not mentioned in any case. In only two cases was the abdominal peritoneum diseased. In one case, reported by Hanot and Gambault, ascites was present, but the peritoneum showed no evidences of an inflammation. In another case the patient was

supposed to have died from an acute general peritonitis, possibly a terminal infection

SYMPTOMS —Onset —In most cases definite symptoms were preceded by a long-standing dyspepsia. In no case was there present the history of a preceding disease involving the stomach. Symptoms that could be referred to the presence of a gastric ulcer were not complained of by the patient.

Vomiting —The most distressing symptom was vomiting. It was present in all of the cases but one. It occurred in paroxysms at the beginning of the disease, later, it was complained of every day. In most cases the ingestion of food preceded the vomiting. In two cases the vomiting of normal ingesta was complained of. In no case was hæmatemesis observed.

Pain —Pain was present in all but one case. It usually preceded the vomiting. In the early stages of the disease it was not severe, later, it was a most distressing symptom. Generally, it was increased by eating. Shooting or radiating pains were not recorded in any case.

Constipation —This symptom was complained of by only two cases.

Emaciation —Emaciation and weakness were very prominent in every case. In all of the cases but one, the wasting, anæmia, and weakness were the cause of the patient's death. The marked and rapid wasting might suggest the presence of malignant disease as the cause. When it is remembered, however, that in most of these cases the gastric mucosa had disappeared, and that the opening in the pylorus had been practically closed, it is not surprising that extreme emaciation, anæmia, and weakness were prominent symptoms. A statement made by Rosenheim¹⁸ concerning atrophy of the stomach is of interest. "Atrophic processes in the stomach mucous membrane have a far-reaching influence upon the body economy. They occur more frequently than has been assumed, and not only relatively frequently with carcinoma, but also as a disease of the stomach for itself. They are without doubt im-

portant factors in the development of the so-called essential anæmia, more so than they have up to now been credited with "

Examination —Physical examination was negative in all but one case. In this instance a movable tumor was found in the region of the stomach, which proved to be a collection of non-malignant tissue doubtless due to trauma.

Examination of the stomach contents, blood, and urine was not recorded in any case. The examinations in the case that I treated have been recorded in the foregoing.

Diagnosis —It is difficult, or impossible, to diagnose a case of cirrhosis of the stomach. The condition might be suspected in a patient who presented symptoms of benign stenosis of the pylorus with a contracted stomach. I believe that it would be impossible, in any case, to exclude malignancy. The following conditions would point to a cirrhosis of the stomach: (1) Long-standing disease. (2) Absence of vomiting of blood. (3) A contracted stomach. (4) Absence of a tumor on palpation. (5) Absence of glandular or hepatic involvement. (6) Improvement of the patient generally, and relief of the stomach symptoms, for a considerable period of time, when rectal feeding is resorted to.

Treatment —The treatment of cirrhosis of the stomach is surgical. I am of the opinion that patients suffering from cirrhosis of the stomach do not die until the pylorus has been so nearly closed as to prevent the passage of food from the stomach into the intestines. If the condition is non-malignant as we have reason to believe from the reports of the cases, and especially in cases in which the gastric mucosa is found to be smooth, firm, and pale when the stomach is opened, gastro-enterostomy should be performed. This operation drains the chronically inflamed stomach and, at the same time, allows the food to pass into the intestines. I shall watch with great interest the results in the case that I have operated upon. Should the condition in the stomach progress, and gradually close the artificial opening, I shall not hesitate to perform a second operation, which will be governed by the conditions found when the abdomen is opened.

BIBLIOGRAPHY

- ¹ Einhorn Diseases of the Stomach, p 165
- ² Osler Practice of Medicine, p 467
- ³ Hemmeter Diseases of the Stomach
- ⁴ Andrew Precis d'anatom Path, Tome 1, p 47
- ^{4a} R F C Leith Albert's System of Medicine, Vol III, p 440
- ⁵ Cruveilhier Anat Path, 1856, Tome III, p 599
- ⁶ Brinton Diseases of the Stomach, 1864
- ⁷ Habershon Diseases of the Stomach, 1869
- ⁸ Wilks Transactions of the Pathological Society of London, 1861
- ⁹ Bret and Paviot Revue de Médecine, May 10, 1894
- ¹⁰ C Allbutt, quoted by Leith System of Medicine, p 467
- ¹¹ G B Hunt Transactions of the Pathological Society of London, 1897-98
- ¹² W B Hadden Transactions of the Pathological Society of London, 1907, 1891
- ¹³ F C Turner Transactions of the Pathological Society, 1887
- ¹⁴ Victor Hanot and Albert Gambault Arch de Physiologie, 1882
- ¹⁵ Dr Jacobi New York Medical Record, Vol XVII, 1880
- ¹⁶ C Bernabei Bollettino di sezione di cultura di scienze mediche e naturali Accademia di fisiocritici di Siena, Vol V, 1887
- ¹⁷ Leuk Untersuchungen zur pathologischen Anatomie des Menschlichen Magens, Zeitsch f klin Med, Band XXXVII, p 296
- ¹⁸ Rosenheim Ueber atrophische Processe an Magenschleimhaut, Berliner klin Wochenschrift, 1888, Nos 51 and 52, pp 1021 and 1044
- ¹⁹ Mathieu, A Eine neue Theorie über die Ursachen mancher Nervenkrankheiten, Volkmann's sammlung Klinischer vortrage, No 106, 1894
- ²⁰ Sandifort Obs Anat Path, Tome III, p 11
- ²¹ Handfield Jones Pathological and Clinical Observations respecting Morbid Conditions of the Stomach, 1854

ON THE TREATMENT OF PENETRATING WOUNDS OF THE ABDOMEN¹

WITH REPORT OF SIXTEEN CASES

BY MALCOLM L. HARRIS, M.D.,
OF CHICAGO,

Professor of Surgery in the Chicago Polyclinic

WE still find some difference of opinion existing among surgeons as to the best method of handling penetrating wounds of the abdomen. It is with the hope that the author's experience during the past two or three years may aid in the solution of this question that this article is written. It is to be understood that these remarks apply entirely to cases in civil life, as the author has had no experience in military practice, and admits the circumstances in the two cases are entirely different. In civil life the wounds are almost always produced by knife-stabs in street or saloon fights, or by bullets from the ordinary pistol or revolver at short range. The cases are usually taken by the ambulance service to the hospital, where they are seen soon after. Having determined that the wound penetrates the abdominal cavity, there are two main questions which immediately present themselves, namely

- 1 Has any of the viscera been injured?
- 2 Is hæmorrhage taking place?

With the exception of hæmaturia pointing to some injury to the urinary tract, and hæmatemesis to injury to the stomach, injuries of the abdominal viscera give rise to no characteristic symptoms whatever. When the wound of the abdominal wall is so great as to permit the partial escape of some of the viscera, or when the intestinal contents or bile are seen issuing from the wound, we have an ocular demonstration of a fact, but these conditions do not properly belong under the head of symptoms.

¹ Read before the Chicago Surgical Society, December, 1903

With the exception, then, of the conditions mentioned, there is absolutely not a single known symptom or group of symptoms which indicates a penetrating wound of any of the abdominal viscera. The stomach, intestine, liver, pancreas, spleen, etc., may be perforated without giving rise to any symptoms by which the fact may be known. Whenever we find symptoms in a patient with a perforating wound of the abdomen, these symptoms always indicate, not that some viscus has been injured, but *something else*, which something else, however, may or may not be the result of a perforation of the viscera. This may appear to be a distinction without a difference, but such is not the case. There is a very material and practical difference, and the sooner it is recognized by the surgeon, the more lives will be saved in this class of injuries. With the exception of shock in its general sense, which indicates nothing specific, but may be present in an injury of any kind, all of the symptoms which are usually associated with injuries of this kind are due to hæmorrhage or peritonitis. This fact cannot be too strongly emphasized. The symptoms of hæmorrhage may come on immediately and result fatally in a few minutes, or they may be delayed some time, depending on the rapidity with which the blood escapes.

The symptoms of severe hæmorrhage, such as a rapid, small, soft pulse, accelerated sighing respiration, restless body and mind, great thirst, pale pinched features, dilated pupils, dim vision, cold clammy skin, etc. are usually easily recognized, but the fact is not so generally appreciated that bleeding may take place slowly and continue for some time without giving rise to marked symptoms. Even the pulse may be maintained at a rather uniform, slow rate so long as the vasomotor system is able to preserve the arterial tension. When this gives way, serious symptoms appear rather suddenly. An abnormal area of dulness in the abdomen which does not necessarily change its location on change of body position, owing to the fact that much of the blood frequently coagulates together with a declining red blood count, are the best evidences that a slow hæmorrhage is taking place.

CASE I illustrates the effect of severe rapid hæmorrhage

November 21, 1903 J L, aged thirty-six years, was shot from directly in front. Bullet entered in the midline about seven centimetres below the ensiform cartilage, and had a slightly downward direction. He reached the hospital and was seen in thirty minutes from the time he was shot. He presented all the symptoms of a severe internal hæmorrhage, as defined above. The pulse was very rapid and weak, at times almost disappearing. The abdomen was opened as quickly as possible. On drawing up the omentum the cavity was found filled with blood, which welled up rapidly from the upper part. Large hot compresses were rapidly placed and the blood cleared away. On withdrawing the compresses carefully the blood was found to issue from a large wound of the root of the mesentery within a few centimetres of the beginning of the jejunum. The patient succumbed on the table from great loss of blood and shock before the full extent of the injuries could be ascertained.

Autopsy showed perforation of left lobe of liver, of anterior and posterior walls of stomach, and transverse mesocolon, two perforations of the upper end of the root of the mesentery. Bullet entered muscles of back and was found down near left hip.

As illustrating the fact that a hæmorrhage of considerable amount may take place slowly within the abdomen without giving rise to any appreciable general symptoms, the following case may be mentioned.

CASE II—J G, aged thirty-six years. A large, strong, healthy man. While working on the corking machine in a beer-bottling establishment, a beer bottle exploded, driving a piece of glass into the abdominal cavity. He was brought to the Alexian Brothers Hospital, November 19, 1902, about noon, and was seen by the author about four hours after the accident. His general condition was excellent. There were practically no symptoms present, and he expressed himself as feeling all right in every way. Pulse was soft, fairly full, and about 75 per minute. There was an irregular wound about four to five centimetres in length in the abdominal wall to the left of the midline and about midway between the umbilicus and the costal arch. An area of dulness could be made out extending from the costal arch

to the left and downward, gradually disappearing. The urine was normal. He was operated on at once by enlarging the original wound. The omentum was found perforated and an artery of considerable size severed just as it was given off by the left gastro-epiploic artery. The lesser peritoneal cavity was filled with blood, and considerable blood was present above the transverse colon and down the outer side of the descending colon. The artery was still bleeding. No injury to any of the viscera was found. The bleeding vessel was secured and the abdomen closed without attempting to remove all the blood present. On the third day the temperature shot up to 104° F, but then became normal, and he recovered without any untoward symptoms. Left the hospital December 17, 1902, but could have gone out ten days sooner had he desired to do so.

The other symptoms which are usually described as indicating perforation of the viscera, such as rigidity of the abdominal muscles, tenderness on pressure, pain, spontaneous or on motion, tympanites, diminution or loss of liver-dulness, rapid small pulse, accelerated costal breathing, vomiting, etc., are not symptoms of perforation, but symptoms of peritonitis. The reason that the mortality following operation in this class of cases was so high, namely, 60 per cent to 80 per cent in the past, is that it was customary for the surgeon to wait for symptoms which would indicate that some of the viscera had been injured. This meant to wait until either the patient was in collapse from hæmorrhage, or peritonitis was so far advanced as to be beyond control.

That such practice has not yet entirely disappeared is shown by a recent article by Vincent (*Revue de Chirurgie*, 1901, xxiv, 1), who says, "In bullet wounds (of the abdomen) it is wiser to abstain from early intervention, because the possible lesions are *incertæ sedis*, because the perforations may be too numerous to be all sutured, and they may develop peritoneal adhesions capable of preventing the escape of intestinal liquids.

"In perforating wounds by sharp instruments, it is probably more advantageous to abstain, to await symptoms of

perforation or peritonitis, of a severe hæmorrhage, and to submit the patient to the action of local refrigeration by the use of ice, to repose, to a diet, and to opium "

I believe such advice to be absolutely pernicious and contrary not only to sound judgment, but to the practice of nearly all American surgeons who have had much experience in this class of cases. As there are absolutely no symptoms in the early stage which indicate a perforating wound of the abdominal contents, and as the symptoms when they do arise indicate a severe hæmorrhage or peritonitis, which in the large majority of cases means a fatal issue, there is but one safe and sound course for the surgeon to pursue, and that is to operate on these cases at the earliest possible moment. As it has been shown by Neff that in at least 95 per cent of these cases damage which needs repair has been inflicted on some of the viscera, it is not only a useless procedure but a great waste of time to attempt to demonstrate the presence of an intestinal perforation by the rectal insufflation of gas or vapor, as recommended by Senn, Sutton, and others, or by the more recent procedure of filling the abdominal cavity with salt solution, withdrawing it later, and submitting to an analysis to determine the presence of contents of the intestinal tract, as recommended by Connell.

In the presence of a penetrating wound of the abdomen, the necessity of opening the cavity at once is so imperative that no time should be lost in useless experimentations. When the abdomen is open, the entire length of the intestinal tract should invariably be examined, as the point of entrance of a bullet or its apparent direction are absolutely unsafe as evidence upon which to speculate that this or that portion of the gut cannot have been injured. While there is a general plan of arrangement of the intestine, this is by no means constant, and one is continually meeting with surprises in these cases. A loop of bowel after being injured may in a very short time move itself to a remote portion of the abdominal cavity, making it appear quite impossible that so many widely separated injuries could have been produced by a bullet travelling in a straight line.

This fact is well illustrated by the following case

CASE III—July 26, 1903 J B, aged thirty-four years While in a fight with another man he was shot from in front at close range The bullet entered the left side of the abdomen about five centimetres above and a little posterior to the anterior superior spine of the ilium The patient reached the Alexian Brothers Hospital about twenty minutes later in good condition Pulse, 92, temperature, 98° F, respiration, 22 Thirty minutes after the injury a blood count showed 4,400,000 reds and 8500 whites Urine negative Abdomen was soft, no special tenderness Stomach was washed out, as it was filled with food and beer Some blood appeared in the washing, which was attributed to the passing of the tube, as the patient had been drinking enough to offer resistance Operation, within an hour of the time of the shooting, muscle-splitting incision at the site of the bullet hole The sigmoid flexure was encountered first In this were found two perforations, one quite low down near the pelvic brim, so low that it was reached and sutured with difficulty Four perforations were found in the jejunum near the middle portion These were thought to be all the perforations, but the colon and stomach were examined as a matter of routine On drawing down the transverse colon, which was well to the upper part of the abdomen, much to our surprise, two perforations were found in it It seems almost impossible that a bullet entering at the point indicated in this case and travelling approximately from before backward could perforate the sigmoid low down, the transverse colon twice, and the jejunum four times, yet such are the facts, which are explainable by the great mobility of nearly all parts of the intestinal tract Although this abdomen was opened within an hour of the time of the shooting, intestinal contents were found distributed from the upper to the lower part of the cavity Thorough irrigation with salt solution was employed and four cigarette drains placed Death on the fourth day from peritonitis At the autopsy all the perforations were found well closed and none had been missed

Another similar example is that of Case IV

CASE IV—June 28 1903 J McC aged thirty-six years Shot from in front with a revolver at short range Bullet entered

right iliac region about McBurney's point Patient reached hospital within an hour in very good condition, and was operated on within two hours Abdomen opened at seat of wound One very large hole was found in the cæcum with considerable hæmorrhage from a branch of the ileocolic artery This had spread into the retrocolonic space as well as into the free cavity Three perforations were found in the jejunum about fifty-four centimetres from the upper end, one bruise of jejunum lower down about two centimetres in diameter, which was turned in, one perforation of mesentery near intestinal border All perforations closed with silk Abdomen irrigated with hot salt solution Four cigarette drains placed No trouble with abdomen, but on eighth day patient developed pneumonia, with temperature from 102° to 103.5° F for about ten days This subsided, and he made a good recovery

As illustrating the difficulty or at times impossibility of finding perforations of the stomach, the following case is given

CASE V — O B, aged nineteen years, was shot July 19, 1903, while trying to escape from a "hold-up" man The bullet entered the eighth interspace in posterior axillary line on the left side and took a transverse direction He reached the hospital about forty minutes later in considerable shock, and complained of great pain in the chest and back Pulse, 110, respiration, 28 Blood count showed 4,800,000 reds, 9800 whites Urine negative It was evident the left pleura and lung had been injured, and from the course of the bullet it seemed certain that it must have perforated the diaphragm and traversed the abdominal cavity A median coeliotomy was therefore made about one and one-half hours after the shooting A large hole was found in the diaphragm, through which blood and air passed in and out of the pleura This was packed with gauze Two perforations were found in the splenic flexure of the colon, which were closed by suture It did not seem possible that the stomach could have escaped, but very careful examination failed to reveal any injury to it It was quite well distended, but no leak could be found The patient's condition was bad, and, as no further wounds could be discovered, cigarette drains were placed and the operation

terminated Five hours after the operation the patient was paraplegic, and in twelve hours he was dead Autopsy showed perforation of left pleura and lung with some blood and air in pleural cavity, perforation of diaphragm, two perforations of splenic flexure of colon (closed by suture), two perforations in cardiac end of the stomach near œsophagus, in what may be called the extraperitoneal portion of the stomach These openings had not permitted any of the contents of the stomach to escape, injury to lower dorsal vertebræ with hæmorrhage into the spinal canal, compressing spinal cord, perforation of right side of diaphragm with hæmorrhage into the right pleural cavity

CASE VI—February 15, 1903 L P, aged thirty years During a quarrel was stabbed in the abdomen and chest He was somewhat under the influence of liquor, but otherwise in good condition when he reached the hospital about half an hour later Was operated on within two hours from the time he was stabbed One stab wound, about two and one-half centimetres in length, was situated just above the right anterior superior spine of the ilium A loop of small intestine protruded through this wound A second wound, about two centimetres long, was situated between the eleventh and twelfth ribs, about seven centimetres to the right of the vertebral spines This opened the pleural cavity and perforated the diaphragm The wound was cleaned and packed with gauze The wound of the abdomen was enlarged, and two cuts, one and one-half centimetres and one-half centimetre respectively in length, were found in the ileum, and one small cut in the cæcum These were all closed and two cigarette drains placed Patient made an uninterrupted recovery

CASE VII—H J, aged fifty-two years, was injured November 11, 1902, in a street-car accident A piece of glass from a broken window produced a somewhat irregular wound about ten centimetres in length, extending obliquely across the upper portion of the right side of the abdomen The wound penetrated the abdominal cavity, and a loop of the small intestine several centimetres in length, which had also been cut by the glass, protruded from the wound He was seen within an hour after the accident The intestine was sutured, thoroughly cleansed and replaced, two cigarette drains introduced and a part of the external wound closed with suture The patient recovered without interruption

CASE VIII was a bullet wound of the liver T G, aged twenty-four years, shot, March 2, 1903, while trying to "hold-up" a saloon keeper The bullet entered about five centimetres to the left of the midline and six to eight centimetres above the umbilicus When he entered the Passavant Hospital his pulse was 124, fair volume, temperature, 99° F Had been drinking Was seen and operated on within two hours of the shooting Median incision The track of the bullet was from before backward and from left to right The bullet entered the left lobe of the liver, passed through the entire breadth of this organ, and escaped from the posterior border on the right side It penetrated the body wall behind and lay just beneath the skin He was bleeding quite freely from the point of entrance and exit in the liver, and considerable blood was found in the abdominal cavity The openings in the liver were packed with gauze It was rather difficult to reach the posterior wound, but this was done, and the ends of the gauze strips were brought out of the anterior incision The incision in the abdominal wall was closed, with the exception of space for the drain Packing removed in about a week Recovered and left hospital April 1, 1903

CASE IX—February 17, 1903 A B, aged fifteen years, shot himself accidentally with a 22-caliber revolver After the accident he ran three blocks, then fainted Was brought to the Alexian Brothers Hospital about 11 30 A M Blood count on entrance, reds 4,205,000, white 6000 Three hours later, blood count, reds 4,120,000, whites 12,000 General condition good Urine negative Bullet entered slightly to left of midline about four centimetres above the umbilicus Operation about five hours after he was shot Median incision Small amount of blood in peritoneal cavity Careful search failed to reveal any injury to any of the viscera The bullet fell from a fold of omentum as this was being straightened out preparatory to closing the incision The bullet had not injured the omentum in the least Its force was just sufficient to penetrate the abdominal wall Wound closed Uninterrupted recovery

CASE X—A S, aged seventeen years On August 19, 1903, he was struck in the abdomen just above the pubis by a bullet fired from a revolver Bullet ricocheted from a stone wall before striking him Patient in good condition when he reached Alexian Brothers Hospital No bladder or rectal symptoms Operation,

median incision, passing through the tract of the bullet. No injury to any of the viscera. Bullet found somewhat flattened on the inner side of the symphysis pubis near its lower border. Wound drained with gauze. Recovery uneventful.

CASE XI—Mrs B, aged twenty-five years. Shot herself with a 32-caliber revolver. Bullet entered abdomen to the left of midline about midway between umbilicus and costal arch. She was brought to the Polyclinic Hospital within a few minutes of the shooting. She showed distinct symptoms of internal hæmorrhage and the pulse was quite rapid and small. Was operated on about an hour and a half after the accident. Median incision, considerable blood in the abdominal cavity. There were found one perforation of the omentum, which was bleeding, two perforations of the jejunum, and four perforations of the mesentery. These were all closed with silk. Abdominal incision closed. Uneventful recovery. Bullet, which lay just beneath the skin of the back to the right of the spine, was removed later under local anæsthesia. Left hospital at the end of three weeks.

CASE XII—M L, aged eighteen years. During a fight was stabbed in the abdomen. Knife entered in the midline just above the umbilicus. Reached the hospital shortly after and was seen and operated on within an hour. Omentum was protruding from the wound. The wound was enlarged, protruding omentum ligated and removed. One good sized wound of small intestine found, which was sutured with silk. Abdomen closed without drainage. Uninterrupted recovery. Left hospital on twenty-first day.

CASE XIII—Mr F, aged twenty-six years. Was in the same fight that Case XII was. Entered the Polyclinic Hospital and was operated on at the same time. Received several stab wounds. Three wounds in the right posterior side of the chest, through one of which air was whistling in and out with respiration, four stabs in left arm and forearm, one stab in left thigh and one stab six centimetres to the left and two and one-half centimetres above the umbilicus, from which omentum was protruding. This wound was enlarged and the protruding omentum ligated and removed. One perforation was found in the jejunum and a slit cut in the transverse mesocolon. These were closed with silk. Abdomen closed without drainage. Wound of pleura was cleaned and packed with gauze. Other wounds dressed.

Recovered without incident and left hospital on the twenty-first day

CASE XIV—I R, aged twenty-six years Shot September 30, 1903 Bullet entered abdomen a trifle above and two and one-half centimetres to the left of the umbilicus Its direction was oblique from left to right Entered Alexian Brothers Hospital about thirty minutes after the shooting in good condition Operation, median incision Two perforations in transverse colon and one in hepatic flexure were found, which were closed by silk suture A counter-opening was made well back on right side of abdomen, through which was introduced a cigarette drain just above the hepatic flexure and transverse colon Abdomen closed in front Considerable thick tenacious yellowish fluid escaped along the drain for three or four weeks It appeared to be bile-stained, but failed to give the reactions for bile On November 18 he suddenly, and without permission, escaped from the hospital He was in excellent condition and had practically recovered, but the small drain opening had not quite closed

CASE XV—J K, aged twenty-five years Shot, November 14, 1903, with a 38-caliber revolver Bullet entered abdomen on a line with the umbilicus about ten centimetres to the left and lay directly under the skin in the back about ten centimetres from the spine Entered Alexian Brothers Hospital in good condition, except that he had been drinking considerable beer Pulse was 90 and full, and there were no symptoms of shock He was operated on about three hours after the shooting Muscle-splitting incision at seat of bullet wound There were found one perforation in colon near beginning of sigmoid, one severe bruise in descending colon, two very large perforations about two and one-half centimetres apart in upper part of jejunum, two bad bruises of jejunum near perforations Perforated part of jejunum had moved to upper part of abdominal cavity quite a distance from point of entrance of bullet Intestinal contents had escaped about adjoining loops Entire small intestine was washed with hot salt solution as it was drawn up and examined Perforations were closed and bruises turned in with silk Four cigarette drains placed, two about loop of jejunum and two about colon Uninterrupted recovery

CASE XVI—The last case to be reported was that of a lad sixteen years of age He ran across the street to see a fight,

and was stabbed in the abdomen. Knife entered a little above and about four centimetres to the right of the anterior superior spine of the ilium. He was brought to the Alexian Brothers Hospital, where he was seen and operated on within two hours of the accident. General condition good and no symptoms of shock. The wound was enlarged and the intestine examined. One loop of ileum was found to have been transfixed by the knife, almost severing the gut, and an adjoining loop entered, making three wounds altogether. These were closed with silk suture and cigarette drains placed. He made an uninterrupted recovery.

In our sixteen cases of penetrating wounds of the abdomen there were three deaths. Case I died quickly from rapid, profuse internal hæmorrhage before the source of the hæmorrhage could be discovered and controlled. It may therefore be excluded. Case V may also be excluded, as death was due to shock from injury to both lungs and pleuræ and to the spinal cord.

Excluding these two cases, we have fourteen cases remaining with but one death, Case III, with eight perforations involving the sigmoid, small intestine, and transverse colon, with death on the third day from peritonitis. While in Case II no injury to any of the viscera was found, still, operation was imperative on account of hæmorrhage. In Cases IX and X neither injury to the viscera nor excessive hæmorrhage was found.

It may be claimed that these cases would have recovered without operation, and this is undoubtedly true, but who could have foretold before the abdomen was opened? The operation not only did no harm, but was productive of good, as the bullet, which might have given rise to subsequent trouble, was removed in each case.

But excluding these cases, we still have eleven cases with perforations and hæmorrhage in which operation was absolutely indicated with but one death. Instead of the usual mortality rate of 60 per cent to 70 per cent following operation, we have over 90 per cent recoveries.

The reasons for this, according to the author's opinion, are chiefly two.

First Immediate operation All cases but one were operated on within three hours or less of the time of the accident

Second Drainage when the gastro-intestinal tract has been opened

Every case in which the gastro-intestinal tract has been perforated must be considered an infected wound Because rarely a case may recover without operation, in which the intestine has been opened, although the proof of this latter point is almost always wanting, except when a faecal fistula forms, is no reason why the large majority of these cases should be subjected to a so-called conservative treatment, which almost certainly ends in death, in order to save the rare case from what may be thought an unnecessary operation

The question of drainage in this class of cases was thoroughly discussed at the meeting of the American Surgical Association, 1902 (*Transactions of the American Surgical Association, 1902*), and the consensus of opinion was in favor of drainage

In conclusion, I wish to emphasize the following points

- 1 In penetrating wounds of the abdomen, there are absolutely no known symptoms which indicate injury to any of the viscera, except those noted above in connection with the urinary tract, stomach, and occasionally the lower bowel

- 2 Except those relating to general shock, all symptoms following such wounds indicate either internal hæmorrhage or peritonitis

- 3 To wait for symptoms of perforation of the intestine means to wait until peritonitis has developed, therefore,

- 4 Every bullet or stab wound which penetrates the abdominal cavity should be operated on at the earliest possible moment in order to anticipate the advent of peritonitis

- 5 No time should be wasted in attempting to demonstrate the presence or absence of intestinal perforation by such means as the rectal insufflation or gases or vapors, or the analysis of recollected intraperitoneally injected air or liquids

- 6 It is essential to systematically examine the entire

gastro-intestinal canal in all cases, regardless of the point of entrance of the wounding body

7 Whenever the alimentary canal has been perforated, suitable drains (the author prefers the so-called cigarette drains) should be placed either through the operative incisions or counter-incisions, as may appear best suited to the individual case

UNILATERAL HÆMATURIA FROM CHRONIC NEPHRITIS

RECOVERY AFTER DECAPSULATION OF KIDNEY

BY LEONARD FREEMAN, M D,
OF DENVER, COLORADO

THE most common cause of obscure renal bleeding is perhaps tuberculosis. Next in frequency comes chronic nephritis, usually of the interstitial type, and often attacking the glomeruli. It may be bilateral or unilateral, it may involve the entire kidney, or appear in small portions of the organ only, which has often led, no doubt, to its non-recognition.

Every physician knows that minute quantities of blood often appear in the urine of patients having interstitial nephritis, especially in its advanced stages; but few seem to be aware that copious and prolonged hæmorrhages may arise, even when the disease is comparatively trivial, as has been demonstrated in many cases during recent years.

Either medical or surgical treatment will be employed according to the amount of the hæmorrhage, the condition of the patient, etc., but it is noticeable that the tendency is more and more towards operation, in severe cases at least.

The following operations have been employed: Nephrectomy, Nephrotomy (with closure of wound or with packing), Decapsulation, Acupuncture, Nephropexy, and Simple exposure of the kidney by lumbar incision.

Nephrectomy should seldom, if ever, be done in chronic nephritis because of the immediate or remote danger of involvement of the other kidney, several disasters having occurred from lack of recognition of this fact.

Nephrotomy has been the operation of choice in the past, and has scored many successes. The manner in which it effects a cure is not readily understood. Some claim that relief of tension through division of the fibrous capsule is the prime

factor, while others contend that the result is obtained by relief of congestion through the formation of new blood-vessels in the adhesions following operation

It has also been asserted that nervous influence is the principal feature, while Senator (*Deut med Woch*, 1902, No 8) is convinced that it is the mere breaking up of adhesions or the fixation of a more or less movable organ

It may be that these explanations are all applicable at different times, according to the nature of the case, but I am inclined to think that the astonishingly rapid disappearance of the bleeding, which so often takes place, is due to local depletion, and that permanent hæmostasis depends upon the growth of new vessels in the perirenal adhesions. In opposition to this view, however, I have seen a profuse renal hæmaturia, in connection with enlargement of the prostate, immediately cease, following a suprapubic cystostomy. Similar observations have been made by others

Decapsulation, which has recently attracted so much attention in the treatment of chronic nephritis, has been attended with fair success. Seeing that many obscure cases of renal hæmaturia are now known to arise from nephritis, it would seem rational to select decapsulation as the operation of choice rather than nephrotomy, because, in addition to stopping the hæmorrhage as effectively, at least, as the latter, it appears to be the best method at our command for checking the nephritis

Acupuncture, although advocated at one time, is no longer to be considered. It is good so far as it goes, but it accomplishes less than either nephrotomy or decapsulation

Nephropexy is required in movable kidney only. As done by most surgeons, it involves a preliminary decapsulation, which may often account for some of the good effects obtained

Simple exposure of the kidney by lumbar incision has on several occasions caused immediate cessation of hæmaturia (Eshner *American Journal of the Medical Sciences*, Vol 1 1903, p 636; Broca, *Centralblatt für Chirurgie*, 1895, p 237). a phenomenon which is rather difficult of explanation except

on the theory of nervous influence or by the previously noted suggestion of Senator

Operations for renal hæmaturia, especially decapsulation, are sufficiently uncommon to warrant the relation of the following case history

The patient, who was referred to me by Dr J E Kinney, was an Irishman, fifty-nine years of age, well built, but very anæmic and considerably emaciated. He first noticed blood in the urine about twenty years ago, since when he has had repeated attacks of bleeding lasting from a few days to a few weeks. The hæmorrhage was often profuse, not to say alarming, the urine being opaque with blood and often thick with clots. At times a jelly-like coagulation would take place in the vessel as soon as the urine was voided. For an entire year previous to the operation the patient had bled constantly and profusely until so weak, anæmic, and emaciated that he could scarcely get about. At various times during his illness pain was experienced over the bladder, but none along the ureters or over the kidneys. There were no uræmic symptoms.

Internal medication failed completely, the suprarenal extract, among other things, being pushed to the limit.

Segregation with the Harris instrument showed that the bleeding came from the left kidney alone, the urine from the right side being normal in color and perfectly clear, although it contained a few hyaline and granular casts and a trace of albumen, which may have come from an imperfect cleansing of the bladder. The total quantity of urine in twenty-four hours was about fifty ounces. (It seems superfluous to add that no operation should be done in these cases without previous separation of the two urines when this is possible.)

There was hypertrophy of the heart and atheroma of the arteries, as determined by Dr J N Hall, who also estimated the percentage of hæmoglobin at about thirty.

The left kidney could not be palpated with certainty, and there was no tenderness, in fact, nothing to call attention to the origin of the hæmorrhage.

A provisional diagnosis was made of unilateral renal hæmaturia from chronic interstitial nephritis, which was concurred in by Dr Hall. Decapsulation of the left kidney was advised, and

the patient put to bed and given iron and strychnine until the hæmoglobin increased to about 50 per cent

Operation June 15, 1903—Under chloroform, a longitudinal lumbar incision was made, the kidney, which was normal in size shelled out of its adherent fatty capsule, delivered with difficulty through the wound, and decapsulated. The surface was granular, mottled yellowish-gray, and the fibrous capsule adherent. Considerable hæmorrhage from the cortex occurred, which was with difficulty checked by prolonged pressure. (Attention has also been called to this bleeding by Albarran, *Centralblatt für Chirurgie*, 1900, p. 24.) The operation lasted thirty minutes.

Recovery was uneventful. During the first twenty-four hours thirty (30) ounces of urine were passed, and during the second twenty-four hours, fifty (50) ounces. The blood rapidly vanished from the urine, which became clear during the night following the operation, that is, within eighteen hours. Many granular and hyaline casts were then found.

During the ten weeks which have elapsed since the operation there has been no return of the hæmaturia. The patient has gained twelve pounds in weight, and has regained strength and energy to an astonishing degree. Analysis of the urine on August 25, 1903, shows it to be normal in color and perfectly clear, with a specific gravity of 1.022, no albumen, no blood-corpuscles, and no casts. Another examination on November 12, 1903, gave similar results. On February 22, 1904, the patient reports himself in excellent condition. Hence, there seems to be recovery not only from the hæmaturia, but also from the chronic nephritis.

A small piece of the renal cortex, which was removed during the operation, was subjected to microscopic examination. It showed a marked glomerulonephritis with abundant small-celled infiltration between the tubules. Some of the glomeruli were almost entirely replaced by connective tissue. There was also advanced arteriosclerosis. It is worthy of remark that in the literature of the subject glomerulonephritis seems to occupy a more prominent position than do other renal lesions.

Conclusions—(1) A prominent cause of renal hæma-

turia, which is often unilateral, is chronic interstitial nephritis, often involving the glomeruli

(2) This, together with other obscure causes, must be excluded before a diagnosis of "essential hæmaturia" can be made

(3) Decapsulation of the kidney is indicated in these cases, as it offers a good prospect for cure of both the hæmaturia and the nephritis. Nephrectomy should be discarded on account of probable involvement of the other kidney

PRIMARY CARCINOMA OF THE BULBOUS URETHRA.

A STATISTICAL DIGEST, WITH REPORTS OF SOME UNRECORDED CASES

BY J. BASIL HALL, M.C. (CANTAB.),

OF BRADFORD, ENGLAND,

Honorary Surgeon to the Royal Infirmary

DURING the year 1901 a case of primary carcinoma of the bulbous urethra was admitted under my care at the Bradford Royal Infirmary, and by a strange coincidence another case was admitted under my colleague, Dr. Jason Wood, within a few weeks. After a careful search, I have succeeded in compiling a list of twenty-one cases in which the diagnosis has been confirmed by microscopic examination. There are also on record five cases in which no such examination was made. Three cases are also on record in which the growth arose primarily in Cowper's glands. This material apparently represents all that is known of this very rare disease. The literature of the subject is very meagre. A good description of the disease is given by Kaufmann,¹ and in 1892 Beck² recorded a case and gave a *résumé* of ten cases which he was able to collect from various sources. The most complete list of cases hitherto published is given by Patterson³ in a "Statistical Digest of Epithelioma of the Penis." In it, however, there is no record of the microscopic examinations. Beyond these papers, I have been unable to find anything except the reports of isolated cases. It occurred to me, therefore, that an accurate record of all the cases I could collect would serve a useful purpose, even if it does nothing more than provide a convenient source for future reference. I am much indebted to W. P. Montgomery for notes of two unpublished cases, and to my colleague, Dr. Jason Wood, for a report of the case which was under his care.

My own case, which I now publish for the first time, is as follows

J W, aged forty-nine years, was admitted into the Bradford Royal Infirmary on November 11, 1901, suffering from a perineal abscess. He stated that he was quite well until ten days previously, when a swelling appeared in the perineum accompanied by much pain. There was no difficulty in passing urine, neither had there ever been any. In my absence, Mr Phillips my house surgeon, incised the abscess under ether anæsthesia. A full-sized Lister's bougie was easily passed into the bladder. The patient left the hospital on November 30, 1901. There was still a sinus, but no urine came through it, and it was apparently closing. He did not attend the hospital again until June 25, 1902. He then stated that the sinus had never quite healed, and that during the last six weeks of the period which had elapsed it had grown very much bigger, and all his urine now passed through it. He had lost a stone in weight. On examination there was found a fissure-like ulcer in the perineum one and a half inches long, with broad everted edges (Fig 1). Beneath it was a solid ovoid mass extending deeply into the perineum and surrounding the urethra. Per rectum, this mass was felt to be quite distinct from the prostate, and lay anterior to the triangular ligament. The whole appearance of the growth was typical of carcinoma. The inguinal glands were not enlarged, and, apart from emaciation, the general health was good.

On July 2, 1902, ether was administered, and the mass freely excised together with the anterior layer of the triangular ligament. The bulbous portion of the urethra was completely buried in the growth, and it was evident that infiltration had already extended beyond the limits of operative interference. The wound, however, healed well, leaving a perineal fistula, through which the urine was passed. The patient had complete control. At the end of a month he went to a convalescent home. The growth, on microscopic examination, proved to be a typical squamous epithelioma. Three months later a recurrence appeared (Fig 2), which grew rapidly, and he died nine months after the operation from exhaustion. There was never any retention or incontinence from first to last, neither was there any pain or suffering. At the time of his death, the perineum was occupied by a fungating ulcer as large as a man's hand. The inguinal glands became enlarged during the last three months. No post-mortem examination was allowed.



FIG. 1.—Photograph of the primary growth taken just before operation



FIG 2 —Photograph showing recurrent growth in the perineum a fortnight before death

The report of Dr Wood's case is as follows

J J, a laborer, aged forty-eight years Admitted into the Bradford Royal Infirmary with chronic retention of urine He gave a history of six months' increasing difficulty in passing urine, which he attributed to the presence of a swelling in the perineum He has had little or no pain, but he cannot voluntarily pass urine, although it is always dribbling away from him He has lost flesh rapidly On his admission the bladder was distended above the pubes, although a catheter passed easily into it In the perineum was a brawny swelling extending into the scrotum It was well defined and without any surrounding cellulitis The inguinal glands were slightly enlarged

Ether was administered and the swelling incised, and found to surround the bulbous urethra, which consisted of a ragged cavity containing much débris Three weeks later the patient died of septic absorption At the post-mortem examination the mass in the perineum was found to consist of a carcinomatous growth closely adherent to the triangular ligament It had eroded the pubic bone, but had not extended to the prostate The inguinal glands were infected Under the microscope, the growth proved to be a typical squamous epithelioma

In both these cases there was no history of venereal disease, neither had the patients suffered from any symptoms of urethral stricture prior to the onset of the disease The previous history of Montgomery's two cases is also similar in these respects The details of his cases are as follows

The first case occurred in a man aged fifty-three years There was a well-localized growth situated three inches from the meatus A total extirpation of the penis and crura was performed When last seen, four months after the operation, there was no recurrence Microscopically the growth was a squamous epithelioma

In the second case, occurring in a man aged forty-seven years, there was a perineal abscess following on a six months' history of stricture Perineal section was performed Death occurred three months later In this case, also, the diagnosis of squamous epithelioma was proved by microscopic examination

After a careful examination of the cases I have been able to collect, I have tabulated them in three classes, firstly, those

PRIMARY CARCINOMA OF URETHRA

I—RECORD OF CASES CONFIRMED BY MICROSCOPICAL EXAMINATION

	Date	Reporter	Reference	Age of Patient	Treatment	Microscopical Report	Result
1	1861	Hutchinson	Trans Path Soc Lond, xii, 167	22	Amputation of penis	Squamous carcinoma	Slight recurrence 3 months later. Removed Well 8 months later
2	1865	Thiersch	Der Epithelial krebs Namentlich der Haut, p 283	60	Perineal section	"	Death 1 month later
3	1881	Schustler	Wiener medicin Wochenschrift, p 120	72	Incision of abscess	"	Death in 6 months
4	1881	Poncet	Gazette Hebdomadaire, p 282	60	Excision	"	Death in 8 months
5	1883	Guyon	Ann des Mal des Organ Gén-Urin, p 513	52	Incision of abscess	"	Death in 5 months
6	1884	Mikulicz-Trzebicki	Wien med Wochenschrift, xx, xxi	68	Amputation of penis	"	Recurrence in 6 months
7	1885	Paul	Lancet, i, p 1127	54	Perineal section	"	Death in 7 months
8	1889	Griffiths	Trans Path Soc Lond, xl, p 177	70	Perineal section	"	Death in 1 month
9	1891	Czerny-Witzenhausen	Beitrage zur klinischen Chirurgie, vii, p 571	55	Perineal section	"	Death in 18 months

II — DOUBTFUL CASES

Date	Reporter	Reference	Age	Treatment	Remarks
1 1835	Thauidère	Schmidt's Jahrbuch, Band vii, p 83	Young (?)	Excision	Not confirmed by microscopic examination Kaufmann rejects this case on clinical evidence also (Verletzungen und Krankheiten der männlichen Harnrohre, 50 a, 1886)
2 1867	Billroth	Chirurgische Klinik, Zurich, p 344	50	?	Induration one and a half inches long in urethra first in front of scrotum Enlarged inguinal glands Not confirmed by microscopic examination This case is also rejected by Kaufmann (Ibid)
3 1881	Poncet	Gazette Hebdomadaire, p 282	56	Refused treatment	Not confirmed by microscopic examination Died in five months
4 1885	Albert	Lehrbuch der Chirurgie, Dritte Aufl, Band iv, p 230	55	?	Long induration commencing at seat of old gonorrheal stricture Secondary nodules in corpora cavernosa and in one crus Not confirmed by microscopic examination
5 —	Grunfeld	Die Endoscopie der Harnrohre, etc, Deutsche Chirurgie, Lief 50, p 193	59	?	Died in three months Diagnosis was made by endoscopic examination Growth commenced in prostatic portion of urethra

III —GROWTHS ARISING PRIMARILY IN COWPER'S GLANDS

	Date	Reporter	Reference	Age	Treatment	Remarks
1	1884	Paquet and Hermann	Jour de l'Anat et de Physiol , 1884, p 615	65	Excision with thermocautery	Complete recovery Microscopic report Epithelioma, the stroma of which has undergone hyaline degeneration (Cylindroma ?)
2	1884	Kocher	Deutsche Chirurgie, Lief 50 a	57	Excision	Small recurrence removed eighteen months after the first operation Recovery Microscopic report Partly typical glandular carcinoma and partly cylindroma (Langhans)
3	1885	Pietrzikowski	Zeitschrift für Heilkunde, 1885, vi, p 421	19	Excision of growth and inguinal glands	Four months later secondary growths in abdomen Microscopic report Carcinoma very rich in cellular elements Beck suggests alveolar sarcoma (Internat Clinics, 1892, Vol 11, Second Series, p 263)

in which the diagnosis has been confirmed by microscopic examination, secondly, those in which no such examination was made and which must therefore be called doubtful cases, thirdly, the three cases of growth arising primarily in Cowper's glands

The four cases now recorded for the first time, namely, those of Montgomery together with Wood's and my own, are included in the first class. These cases, together with seventeen others which have been previously recorded, make up a total of twenty-one undoubted examples of the disease. Of the doubtful cases, five in number, three have already been rejected by Kaufmann on the ground of insufficient clinical evidence, namely, those of Billroth, Albert, and Thiaudière. Poncet's case is equally inconclusive. (It may be noted here, to prevent confusion, that Poncet has recorded two cases, one confirmed by microscopic examination and the other not so confirmed.) I have included Grunfeld's case in this class, but as the growth was said to have probably originated in the prostatic urethra, it has no right to a place except for the sake of completeness. The three cases of growth arising primarily in Cowper's glands have already been fully reported and also reviewed by Beck,² so that no further mention need be made of them here.

There remains, therefore, for consideration a list of twenty-one cases of undoubted epithelioma of the bulbous urethra. In reviewing the symptoms of this disease, Beck² wrote as follows: "Primary cancer of the urethra occurs in men over fifty who have most commonly suffered from some previous disease of the canal, usually gonorrhæal stricture. The most prominent symptom is the gradual formation of a hard, lobulated mass round the urethra. Micturition becomes increasingly difficult, and is almost always very painful, far more so than in simple stricture. Hæmorrhage, especially before and after micturition, seems to be a common symptom. As the growth extends, the crura and corpora cavernosa become implicated, and the disease advances past the scrotum into the penile portion of the urethra. The glands in the groin en-

large, and the patient becomes cachectic in appearance. The passage of instruments is from the beginning difficult, and is always followed by bleeding." In the light of experience gained from a larger number of cases than Beck had at his disposal at the time of his publication, it is evident that some of the symptoms he enumerates cannot be relied upon with any degree of certainty. In the cases observed by Wood, Griffiths, Montgomery, and myself, for example, there was a marked absence of pain and hæmorrhage, and in two of these instruments passed with great ease into the bladder. Moreover, the amount of induration associated with simple stricture varies within wide limits. Indeed, after a careful review of all the cases, I am forced to the conclusion that a differential diagnosis between malignant disease and simple induration is frequently impossible prior to operation, excepting when the size of the perineal swelling is out of all proportion to that usually found associated with simple stricture. Unfortunately, the rarity of malignant disease in this situation is such that suspicion is not easily aroused under any circumstances. As many of the cases hitherto have been only briefly reported, it is impossible to give actual figures, but there is no doubt that in many instances the diagnosis has only been made during or after an operation. It is very necessary, therefore, always to bear in mind that such cases do occasionally occur, and whenever a patient presents himself for examination with a well-marked perineal swelling, the possibility of malignancy should be carefully considered. As regards treatment, in half the cases it has been palliative and in the other half radical, after excluding one case (Fuller's) in which no treatment was adopted. Perineal section or simple incision was done in ten cases. In one of these (Beck's) the patient was lost sight of, but he certainly could not have lived more than a few weeks. One lived eighteen months, and the remaining eight all died within nine months.

Of the ten cases treated by resection or some form of extirpation, the result is unrecorded in one. Of the remaining nine, death occurred within nine months in four, and one is

stated to have had a recurrence within six months of the operation. Of the remaining four the subsequent history is incomplete, it being merely stated that there was no recurrence at twenty-one months, eleven months, ten months, and four months respectively. Whilst the results of treatment, therefore, are not encouraging, extirpation is worth a trial, provided the disease is recognised in an early stage. The growth invariably spreads towards the penis, and shows no tendency to invade the prostate and tissues behind the triangular ligament. Lymphatic infection occurs in the inguinal glands, and is therefore also amenable to surgical treatment.

With our present lack of knowledge regarding the etiology of malignant disease, the rarity of its occurrence in this situation must at present remain a mystery. It is evident, however, that the urethra of all situations should be a common one for cancer if Cohnheim's theory or the theory of chronic irritation be accepted. On the other hand, if a specific micro-organism be invoked as the essential cause, it is difficult to understand this immunity of the urethra from cancer, especially when it is remembered how easily the gonococcus infection is obtained in this situation.

REFERENCES

- ¹ *Injuries and Diseases of the Male Urethra*, 1886
- ² *International Clinics*, Vol. 11, Second Series, 1892
- ³ *University of Pennsylvania Medical Bulletin*, July, 1901
- ⁴ *Medical Chronicle*, June, 1901

COMPLICATIONS AND SEQUELS OF PROSTATECTOMY.

BY JAMES E MOORE, M D ,

OF MINNEAPOLIS,

Professor of Clinical Surgery in the University of Minnesota

AT the present time no single operator has had sufficient experience to enable him to speak authoritatively upon this subject, and such extremes of experience have been reported that it is difficult to estimate the real dangers and difficulties of prostatectomy. Dr Goodfellow, in a paper upon "Perineal Prostatectomy," read before the California Academy of Medicine, April 29, 1902, says, "We can confidently say to sufferers from the troubles incident to hypertrophied prostate that a cure is absolutely certain, the danger practically nil." On the other hand, Dr Chetwood, in the *Medical News* of August 8, 1903, says, "No thoughtful surgeon will declare that the mortality rate of prostatectomy is trivial."

Prostatectomy, involving as it does such important anatomical structures and being performed as it often must be under such adverse conditions, is a capital operation, and no capital operation is without a death-rate, serious complications, and sequels. With our improved technique the mortality is not high, the complications and sequels are constantly growing fewer, but they must necessarily exist, and it is only by faithfully noting and reporting them that we can hope to reduce them to the minimum. It is altogether too grave an operation to be resorted to as a routine treatment for every enlarged prostate, and is applicable only to properly selected cases. There will always be a place for palliative measures in neglected cases of prostatic enlargement.

It is not wise to say that after a certain age a man is not a fit subject for this operation, because the number of years he has lived is not a proper index to his surgical age. As long as a man's heart, arteries, and kidneys are in fit condition to

allow the administration of an anæsthetic, he is a fit subject for surgery

The most frequent cause of death following this operation is uræmia, consequently the most important preliminary examinations are those of the kidneys. Unfortunately, the enlarged prostate and inflamed bladder make it a difficult matter to ascertain the exact condition of the kidneys, but after the usual microscopic and chemical examination of the urine made by a competent person, we are warranted in operating so long as there is no positive evidence of serious kidney involvement. In the presence of such evidence, the operation is contra-indicated, and we must be content under these conditions to resort to palliative measures only. The modern practice of administering water and urotropine freely for a few days preceding and following operation undoubtedly carries some patients from the border-line to the safe side.

The next greatest danger is sepsis, and in the presence of an infected bladder it is an ever-present one. These old men will bear up under an operation almost as well as younger ones so long as wound infection does not take place, but they have very much less resisting power against sepsis. It is impossible to disinfect a thickened, badly infected bladder before operation, so our only hope lies in thoroughly cleansing the wound and providing for free drainage.

The complicating cystitis is often at the present time the most positive indication for operation, and it is for the relief of this complication that the various palliative measures are most frequently employed. Our only means of preventing cystitis as a complication is to get prostatectomy so well established that it will be the accepted method of treatment when catheter life would otherwise begin. The only satisfactory treatment for this complication is drainage, and this is best brought about by perineal prostatectomy.

Stone is a frequent complication of enlarged prostate and should always be sought for and removed during the operation. Cases are on record in which a stone has been overlooked, and as a consequence the operation was a failure. This might very

readily happen in the perineal operation unless the operator made a deliberate search for stone

The incision for a prostatectomy when too extensive causes various complications. In the upper operation it may injure the peritoneum, and in the lower one important muscles, blood-vessels, and nerves are unnecessarily injured by an extensive cut. The peritoneum is ordinarily easy to avoid, but with a contracted bladder the danger of injury to this membrane is great. In the perineal operation the tendency is to employ the straight median incision, because it certainly does the least injury, and because those who have employed it find that a more extensive incision is unnecessary. On the contrary, those who have employed the larger incisions have learned that they are not necessary, and that they do cause unnecessary complications. Beginners are prone to cut too much, because they think it makes the operation easier, and because they have not been properly warned against the complications arising therefrom.

Hæmorrhage is an occasional complication, but its dangers have doubtless been over-estimated. The writer has had no serious hæmorrhage complicating the perineal operation, but has had some anxious hours from this trouble in the supra-pubic operation. The median perineal incision certainly reduces this danger to the minimum. It is always better to control the hæmorrhage by ligature or forcipressure when practical rather than resort to packing, for packing firm enough to control the hæmorrhage causes severe pain and may cause sloughing.

Too little effort is made to protect the urethra in the perineal operation. It simplifies the operation wonderfully to sacrifice the whole prostatic urethra, as is frequently done, and it is marvellous how quickly nature compensates for its loss, but it is not reasonable to expect that there will not be traumatic stricture later. We all know what a serious matter a traumatism to other portions of the urethra often proves to be, and there is no reason why the same will not prove true of this part. Within the next few years we will all see patients suffering

from this cause who are now listed among the cured. This operation is a mutilating one at best, and it is our duty to be as conservative as possible. The destruction of a certain part of the lower wall of the urethra is unavoidable, but the upper and side walls can and should be preserved. We must not try to develop a grand-stand operation which yields brilliant results for a time only to be followed by disappointment later, but rather a conservative operation, which cures so that the patient can live out his expectancy in comfort. A man with a traumatic stricture at the neck of his bladder may be in a worse condition than one with an enlarged prostate.

One of the serious objections to the suprapubic operation is the extensive injury done to the bladder. With proper care, extensive injury to this organ can be avoided in the perineal operation. The writer has repeatedly demonstrated on the living and the dead subject that in a case suitable to this operation the gland can be enucleated without serious injury to the bladder. The muscular fibres of the bladder are continuous with those of the gland, but there is always a distinct layer of bladder fibres which are independent and to the inner side of the gland. Over the third lobe it is often quite thin and requires great care for its preservation. When the bladder is torn, the wound should be closed with catgut.

The most difficult problem in the perineal operation is how to avoid injury to the rectum. There are very few, if any, operators who have never met with this accident. It is not a disastrous event when it does happen, but is always a serious complication. The rectum may be torn through, or it may be so injured that it will slough through after a few days. In order to avoid this accident, it is necessary to follow the urethra closely back to the apex of the gland, then open and keep well within the capsule. None but an experienced and trustworthy assistant should be allowed to hold the retractor on the rectal side, for it is a very easy matter to push the instrument through the bowel. When the accident does occur, the opening should be closed with stitches to the rectal side backed up by catgut on the perineal side. When the opening is small, a purse-string will suffice.

Can we preserve the seminal ducts? It is certain that with our present technique we do not preserve them, and in the case of a virile man this is surely a very grave complication. As this operation becomes better established, we will operate earlier and necessarily upon younger men, when this will become a serious question. Young, of Baltimore, has reported to the American Association of Genito-Urinary Surgeons a technique by which he claims to be able to preserve these ducts, and this is certainly a necessary step if we hope to establish the early operation for prostatic enlargement.

For a comparatively young man impotence is certainly the most serious sequel of prostatectomy, and one to which we must give careful consideration. With our present technique which destroys the ducts, it is doubtful if any man has the power of procreation after a prostatectomy, and some lose the power of copulation. The prostate is undoubtedly a generative organ, but whether it is an indispensable one, remains to be demonstrated. It seems rational to believe that interference with blood and nerve supply by a too liberal perineal incision may be a cause of impotence. This possibility certainly affords food for reflection.

An occasional sequel of prostatectomy is incontinence or dribbling. This is due either to injury to muscles or nerves or to the neck of the bladder, most frequently the latter. This condition should rarely obtain, because by proper care and conservatism it can be avoided. A careless or inexperienced operator may very easily tear away that portion of the sphincter of the bladder just below the urethra and in front of the third lobe, which would be very liable to be followed by incontinence.

The perineal wound is usually closed inside of three weeks, but a perineal fistula will occasionally remain. This may be caused by too protracted draining. It is rarely necessary to leave a tube in the bladder for more than a week, and it may often be removed earlier to advantage. This delay in the closure of the wound may be due to the fact that the operator did not properly close the cavity left by the removal of the gland. The lateral walls should be carefully approximated by

buried catgut sutures, as we do in operations upon the female perineum, so that there remains but a channel for the drainage tube to pass from the bladder to the outside. Later, when we learn to operate upon prostates before the bladders are infected, we may be able to close the perineal wound completely, draining through the urethra only. It is a mistake to fill a large space in the perineum with gauze, because it delays union and leads to complications and sequels. When a fistula shows a tendency to become chronic, it can be cured by a plastic operation followed by a catheter in the bladder for a few days.

A communication between the urethra and the rectum is one of the sequels met with occasionally. The writer operated upon one such case successfully by dissecting up through the perineum, closing the openings in the urethra and bowel with fine chromic gut, and leaving a gauze drain between these two points extending out through the perineum. By leaving the gauze between the two points repaired, it was hoped that if one fistula failed to close at once, the other might heal, and this was just what did happen, nature finally completing the cure without further assistance.

Epididymitis is quite a common sequel of prostatectomy, sometimes becoming so troublesome as to require the removal of the epididymis. It may be caused or aggravated by the injudicious use of sounds, and should always be remembered as a possibility when they are employed.

Because the writer has dealt briefly upon possible as well as probable complications and sequels of prostatectomy, he does not wish to be classed a pessimist. The true optimist is one who recognizes difficulties with the hope of overcoming them. In order to place this operation on a proper footing, it is necessary to recognize the fact that it is not the bed of roses some of our over-enthusiastic brethren who have operated upon a few cases successfully would have us believe. Some failures are bound to follow this important operation, as they do every operation of like magnitude, but, notwithstanding this fact, it is destined to be one of the greatest boons modern surgery has to offer suffering mankind.

A CASE OF ENORMOUS PROSTATIC CALCULUS¹

SECONDARY TO TRAUMATIC STRICTURE OF THE PERINEAL URETHRA, SUPPURATION ABOUT THE STONE, SECONDARY ABSCESS IN THE PELVIS, EXTENSIVE URETHRORECTAL FISTULA FOLLOWING PERINEAL SECTION FOR THE CALCULUS, PERINEAL RECTOPLASTY FOR THE CLOSURE OF THE FISTULA, RECOVERY

BY G FRANK LYDSTON, M D,

OF CHICAGO,

Professor of the Surgical Diseases of the Genito-Urinary Organs, Medical Department of the Illinois State University, Surgeon to St Mary's and Samaritan Hospitals

M B, farmer, aged thirty-four years, referred to me by Dr V H Ruble, of Pierre, South Dakota, first consulted me on the 15th of June, 1900 His history was as follows

He had been perfectly well until four years previously, when his horse fell upon him, producing various injuries, the most severe of which was apparently a blow upon the perineum This was followed by hæmaturia for one week There was no urinary obstruction nor retention, and he was apparently as well as before the accident within ten days after its occurrence He remained well for six months, at the end of which time he noticed difficulty in micturition The stream diminished in size with frequent desire to micturate This condition increased steadily One year before consulting me he passed several small calculi He has passed calculi at intervals ever since At the time he first consulted me the stream of urine was very small, there was considerable difficulty in evacuating the bladder, and he was having occasional chills, especially if the urethra was interfered with by instruments

On examination I found a hard, callous stricture in the bulbo-membranous region, with secondary cystitis This was permeable to No 20 Charriere Perineal section was advised and consented to The operation was, however, deferred for a few days at the patient's request, preparatory treatment being meanwhile instituted The patient chanced to come in contact with some physician, by whom he was dissuaded from submitting to the operation,

¹ Read before the Chicago Medical Society, December, 1903

being told that he could be cured by medicine I afterwards was informed by Dr Ruble that his patient had returned home after an alleged cure

November 28, 1901, the patient returned to me for examination I found at this time a large tumor in the prostate, distinctly jutting into the rectum This was of stony hardness and absolutely immobile I made a diagnosis of secondary calculus embedded in the prostate The patient could still micturate, and the urethra was, as before, permeable to No 20 French The stone could not be felt by urethral exploration Operation was again proposed, it being my intention to perform a suprapubic section as well as a perineal urethrotomy The patient again consented, but delayed submitting himself to the knife on one pretext or another for some days, during which he fell under the spell of several gentlemen who, like his previous surreptitious consultants, informed him that the diagnosis of his case was wrong, and that he could be cured by remedies The most I could do with him before he escaped from my supervision was to secure a skiagraph of the stone, which is presented herewith (Fig 1) Having been again cured by medicines, the patient returned to his home in Dakota, and I did not hear from him again until the 12th of October, when he was brought into my office by Dr Ruble, who gave the following interesting history

In May last, suppuration occurred about the calculus and a secondary abscess formed in the pelvis, I infer from infection of the pelvic lymphatic glands This was evacuated at the external inguinal ring, it having pointed through the inguinal canal on the right side More than a pint of pus was evacuated and the abscess promptly healed Dr Ruble considered it expedient to remove the calculus from the prostate by way of the perineum For a time afterwards the patient did apparently well, and for some weeks was passing his urine *per vias naturales*

Some time after the perineal section, it was noticed that a pouch containing fluid had formed in the perineum Dr Ruble opened this pouch, evacuating a quantity of pus and decomposed urine The cavity not only did not heal, but thereafter the feces and urine were discharged through the perineal opening and also appeared at the meatus Urination subsequently took place entirely by way of the perineum

When I examined the patient on the 12th of October, I found

Left Side.



Post.

FIG. 1.—Skiagraph of prostatic calculus.



a large pouch in the perineum communicating with the perineal wound, this was lined by pseudomembrane, and at its posterior extremity connected with the urethra. The perineal portion of the urethra was the site of a firm, callous stricture which extended from the middle of the perineum back to the bulbomembranous junction. It had been impossible to pass the sound into the bladder since the last perineal operation. I did not, however, attempt to pass an instrument at this time. Fæces and urine were discharging freely through the perineal wound and fæces appearing at the meatus. On rectal exploration, I found a fistula in the anterior wall of the rectum, approximately two inches in length and half an inch in width. On inquiry, I found that an attempt at a plastic operation from the rectal aspect of the fistula had been attempted. This is important only as explaining to a certain extent the loss of tissue, the greater portion of which, however, had been lost by sloughing or ulceration after the perineal operation for the calculus.

I proposed operation for the relief of the stricture and repair of the rectum.

Operation—The operation was performed the following morning. I made the ordinary Y incision in the perineum, so extensively used for prostatectomy. The urethra and rectum were separated to a point about one inch above the upper angle of the fistula. This point corresponded very nearly with the prostatovesical junction. The dissection was accomplished with considerable difficulty, the urethra and bowel being fused together firmly by cicatricial tissue. When the separation was effected, three good sized pockets were found about the neck of the bladder, representing the pouch formed by the pressure of the calculus and the results of the destruction of the prostate and its environs by suppuration. Great difficulty was experienced in repairing the fistula in the rectum. The operation was very tedious, but I finally succeeded in closing the rent in the bowel with three superimposed lines of chromicized catgut. The two lines of suture first inserted were made continuous, the final line of suture was the ordinary Lembert. Especial effort was made in repairing the opening of the bowel to get as large a surface of denuded tissue as possible. When the suturing was completed, a considerable buttress of freshened tissue covered the opening in the bowel. A fortunate circumstance of the suturing was the fact that the

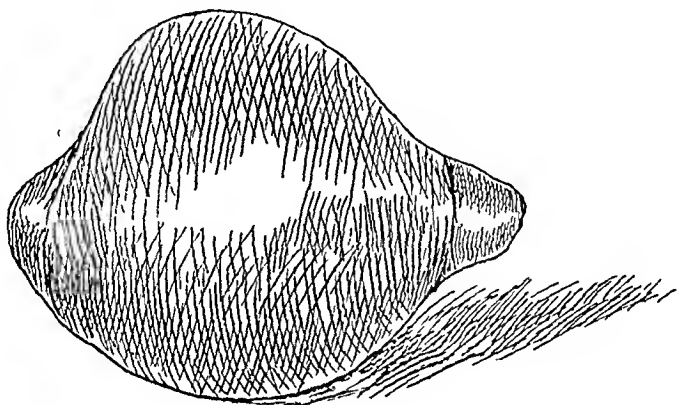
fistula was drawn to the right of the median line, thus lessening the chances of a re-establishment of continuity between the urethra and bowel. In future operations of the kind, I shall make the attempt to displace the line of suture laterally, as a systematic procedure. The callous stricture in the perineum was cut away, leaving merely a strip of mucous membrane on the roof of the canal. When this portion of the operation was completed, the floor of the urethra was entirely gone from the middle of the perineum to the prostatovesical junction, the internal sphincter vesicæ being alone intact. No attempt was made to close the urethra by a plastic procedure. The sphincter ani having been thoroughly dilated at the beginning of the operation, a large tube, wound with iodoform gauze, was inserted into the bowel to protect the repaired area from disturbance by gas and fæces. The operation was completed by packing thoroughly with iodoform gauze the extensive cavity which now occupied the perineal body as far as the orifice of the bladder. A catheter was retained for twenty-four hours, after which time no attempt was made to divert the urine from the track of the wound. It was found that, subsequent to the removal of the catheter, the packing in the perineum was so effective that the urine in great part began to flow through the normal channel. The first strips of gauze which were introduced into the wound were so closely applied to the line of union of the fistula as to protect it completely from such portion of the urine as might escape *via* the perineum.

The patient's present condition is apparently extremely satisfactory. The perineal wound is almost completely closed, and the urine escapes almost entirely by the normal channel. The rectal fistula is almost entirely closed. No fæces have escaped at any time into the perineal wound. There is, however, an occasional escape of gas. This escapes slowly and in very small quantities, indicating that the opening in the bowel which still remains is very small. No urine escapes by the rectum, as was the case prior to operation. Rectal examination with the finger fails to detect any solution of continuity in the bowel, whereas, prior to the operation, the finger readily passed from the interior of the bowel through the fistula, and as far as the length of the finger would permit, into the perineum anteriorly and into the various pockets about the neck of the bladder hitherto described posteriorly. Proctoscopic exploration fails to find the fistulous open-

ing It will thus be seen that primary union of the fistula was almost complete I have little doubt that the result will be entirely satisfactory Complete closure is probable Should a small opening persist between the bowel and urethra, it will quite likely close under cauterization from within the bowel, as has occurred in several cases of a similar character coming under my observation

The calculus (Fig 2) removed in this case weighs 720 grains I have not made a section of it, so I am not prepared to state what

FIG 2



Prostatic calculus

is the composition of its nucleus The rationale of its formation is, I think, as follows As a consequence of the traumatic stricture of the urethra, a certain quantity of residual urine continually remained in the canal Decomposition followed, with the formation of secondary calculi The obstruction to the outflow of urine meanwhile caused dilatation of the prostatic ducts As the outflowing stream of urine during micturition came in contact with the obstruction afforded by the traumatic stricture, these small secondary calculi were forced against the latter and returned in the periphery of the stream One of these calculi becoming lodged in a dilated prostatic duct formed a nucleus around which laminae of phosphatic deposit occurred This produced a rapid growth of the calculus, which growth continued until it attained the size shown in the specimen It is, of course, possible that the stone formed in the prostatic utricle

FIBROMATA OF THE TUNICA VAGINALIS¹

BY EDWARD A BALLOCH, M D,

OF WASHINGTON, D C,

Assistant Professor of Surgery in Howard University, Surgeon to Freedmen's Hospital

THE case which forms the basis of this communication is as follows

C D, colored, male, sixteen years of age, and a farmer by occupation, entered the Freedmen's Hospital, December 9, 1902. He gave the following history: Was born and has always lived in the country. Father living and healthy. Mother died in 1890, the cause of death being unknown. Eleven brothers and seven sisters living and healthy. Two sisters dead of unknown causes. Patient himself has always been healthy, having escaped even the usual diseases of childhood. Does not use alcohol. When questioned as to his venereal history, he at first stated that in 1884 he had a yellowish discharge from the penis, followed by an abscess in right groin, which statement he afterwards denied. When it is considered that at that time he would have been but eight years old, it is probable that the discharge, if indeed he had one, was not gonorrhoeal. No history of any injury to scrotum. The present trouble began over eight years ago. First appeared as a swelling in the upper part of right side of the scrotum, which has continued to enlarge ever since. The growth has been painless. There has never been any enlargement of the scrotum except that caused by the growths. The only inconvenience suffered has been that incident to the size of the growths and some pain after heavy lifting or over-exertion.

Examination shows a greatly enlarged scrotum, reaching nearly to the knees. It is somewhat pyriform in shape, with the apex below. Skin of scrotum shiny from stretching, but otherwise normal. Veins of scrotum prominent. Right testicle felt at a point twenty centimetres (eight inches) below external inguinal ring and is normal in size, shape, and consistence. The

¹ Read before the Southern Surgical and Gynecological Association, December 17, 1903

cord can be traced to the external ring. Left testicle ten centimetres (four inches) below external ring and feels normal in every way. The scrotum is not tense and does not contain fluid. The tissues of the scrotum have a flabby, gelatinous feel, which is peculiar. Three separate masses can be felt in the right side of the scrotum. One is high up, near external ring, the others lying diagonally from it downward and to the left. All are freely movable. No point of attachment can be made out, either to the testicle, cord, or walls of the scrotum. The upper mass is smooth and even, the other two are lobulated. The lower growth feels somewhat larger than the others. All are hard and dense to the feel. Owing to his conflicting statements as to a urethral discharge, with abscess, the groins were carefully searched for old scars, with an absolutely negative result. A keloid was found behind the right ear, the result of an old cut in that situation, six centimetres (two and one-half inches) long. Thoracic and abdominal viscera normal.

The diagnosis was fibroid growths in the tunica vaginalis. This was based partly on the history of a slow, painless growth, the absence of any glandular involvement and the freedom of the patient from cachexia of any kind. These points, with the absence of ulceration or fistula, served to exclude tuberculosis, syphilis, and malignant disease, while the hard, dense, lobulated feel of the growths, together with the presence of keloid, indicated a positive diagnosis of fibroma.

Operation, December 15, 1902—Incision in right side of scrotum down to the growths. The tunica vaginalis was greatly enlarged and thickened and was converted into a gelatinous mass. The upper tumor ran into the inguinal canal and was attached there by a pedicle. For the other two no distinct points of attachment could be made out. They seemed to be embedded in the thickened tissues of the tunic. All the growths were enucleated without difficulty. In dissecting out the gelatinous tunica, the cord on the right side was cut accidentally, and, together with the testicle on that side, was removed. This accident was deplored at the time, but, in view of the report of the pathologist, it is perhaps as well that these structures were removed. The excess of skin in the scrotum was cut away and the wound closed without drainage. Healing was aseptic and uneventful. The largest growth measured thirteen by eight centimetres (five by three

inches), and the other two, ten by six centimetres (four by two and one-half inches) The weight of the entire mass, tumors and tunic, was 1644 grammes (fifty-eight ounces) The tumors alone weighed 1077 grammes (thirty-eight ounces) and the tunica 567 grammes (twenty ounces) (See Fig)

I have recently heard from the boy to the effect that he was in perfect health and strength

The report of the pathologist was that the main structure of the tumors was fibrous tissue At many points throughout the masses were areas of myxomatous and fatty degeneration The tunica vaginalis was myxomatous throughout The testicle also showed areas of myxomatous degeneration He classed the tumors as soft fibromata undergoing degeneration

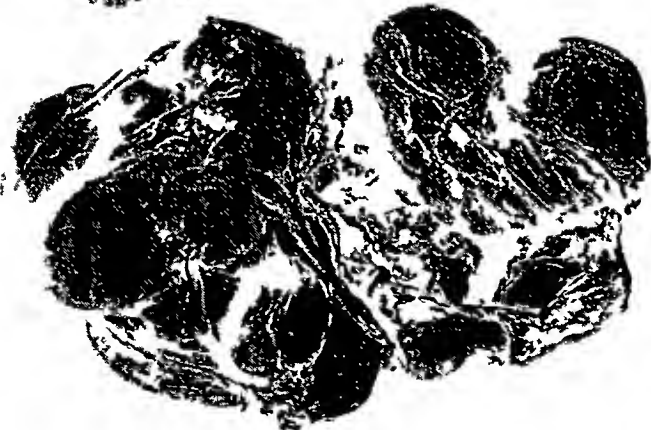
In considering these unusual growths, it must be accepted, I think, that they are essentially fibrous in character, and that the fatty and myxomatous areas are but expressions of the degenerations which fibrous growths anywhere are liable to undergo This association of fibroma with myxoma and lipoma has been noted in fibrous growths in various situations, and is a well-recognized pathologic fact

As to the etiology of these tumors, it is probable that, in spite of the absence of any such history, there must have been some injury or irritation which acted as a starting-point The vague history of a urethral discharge may explain this It is notoriously difficult in people of his race to get anything like a connected or reliable history It is hard to conceive of the spontaneous origin of growths like these from the tunica vaginalis Another factor of some importance is the existence of the keloid in this case This may reasonably be interpreted as showing a tendency to fibromatosis in this individual

The writer has elsewhere¹ called attention to fibroid degeneration as a peculiarity of the negro race, and offers this case as a confirmation of the theory there advanced

It may be of advantage for purposes of comparison to consider for a moment the occurrence of fibrous growths in some of the other serous cavities Fibromata have been found in the pleura, the peritoneum, the pericardium, and the joint

Fig. 1. Fibroma of the tunica vaginalis.



Fibromata of the tunica vaginalis

cavities In the pleura and peritoneum these growths have been found loose It has been supposed that they existed first as fibrous elevations on the surface of the membrane, originating in the subserous connective tissue, then became pedunculated, and, finally, by the constriction and severance of the pedicles, became loose, floating bodies

Myxomatous peritonitis, while rare, does exist and gives rise to masses of gelatinous, straw-colored material, which may be scooped out of the cavity and may be mixed with fibrin This is secreted by the peritoneal endothelium and is generally secondary

That some such course of events must have occurred in this case seems likely, owing to the extensive myxomatous degeneration of the tunica vaginalis The entire membrane was converted into a gelatinous mass, resembling the Whartonian jelly of the umbilical cord This, however, does not explain the like degeneration in the testicle From the limited areas of degeneration, it is reasonable to assume that the disease in the testicle was secondary, and that it may have resulted by continuity

A careful consideration of all the facts in this case would seem to indicate the following chain of events An irritation of the tunica vaginalis, from an injury or a possible gonorrhœa, causing a myxomatous degeneration of that membrane The consequent irritation of the subserous connective tissue resulted in the formation of fibrous nodules, which gradually became pedunculated, and finally, in the case of two of them, resulted in their becoming free in the cavity, the third being still attached to the membrane The myxomatous degeneration of that part of the tunic overlying the testicle may have resulted in a similar degeneration in that organ

A case reported by Curling² shows that this supposition is not improbable Curling's patient was a man of twenty-four years, in whom the disease had existed for eighteen months The cavity of the tunica was found to be distended by yellowish, morbid material, resembling fibroid matter, growing from the visceral surface of the tunic It was lami-

nated in structure and of a fibroplastic appearance under the microscope. The external parts of the deposit were organized. Patches of a similar structure were found in the testicle, and the epididymis was infiltrated and destroyed.

Had this case gone on long enough, it is probable that a condition similar to that found in my case would have resulted.

A thorough examination of the literature on this subject shows that the case here reported is practically unique, but one other at all resembling it being found. There are several references to what, at first sight, seem to be similar growths, but which upon closer examination turn out to be essentially different in important particulars. Most of them are found to be cases of cartilaginous or calcareous degeneration of the tunic following syphilis or prolonged suppuration in the scrotum of the testicle.

The case referred to as resembling mine is that of Holmes³. His patient was a man of fifty-one years, who had had a tumor of the scrotum for thirty-three years. At the time that it came under Holmes's observation it was as large as a cocoanut, but it was stated that recently the growth had been more rapid, and that it had become more painful. At the operation it was found to be situated above the testicle and in front of the cord. It was removed and was found to be "solid, with soft spots." It was connected to the testicle by some areolar tissue, and was thought to spring from the tunica vaginalis. On section, it presented a grayish mass with glistening bands radiating in all directions. The centre was soft. Under the microscope it showed fibrous tissue, free nuclei, and oil globules.

In the same volume, Jessop⁴ reports a case of tumor of the left side of the scrotum in a man of forty-nine years, which had existed for ten months and was the size of a child's head. The tunica contained fluid. The testicle is reported as "obscured," whatever that may mean. Microscopic examination showed areolar tissue. The tumor had grown rapidly, owing to an infiltration of albuminous fluid. Pathological report was to the effect that the elementary parts of the tumor belonged to

the connective-tissue group, the structure varying in different situations. Some parts showed waxy-white connective-tissue network, enclosing fat cells. The report closes by saying that the tumor showed characteristics of "lipoma, fibroma, and sarcoma."

It may be said of this case that the pathological report, like the testicle, is "obscured," but that, while very imperfectly reported, it resembles more nearly than anything else a sarcoma of the testicle.

E. Chambord,⁵ in his thesis, "*Étude sur l'anatomie et la pathologie de la tunique vaginale*," which is an exhaustive study of the subject, makes no reference to fibrous tumors of the tunic, except the "floating bodies" that sometimes occur after hydrocele which has been treated by injections of iodine.

Tikhonovich⁶ reports the case of a man of twenty-four years, who entered the hospital complaining of pain in left testicle. Seven years before, while hewing wood, had struck left testicle with the handle of an axe. Painless tumors soon appeared on the postero-external surface and had grown gradually to their present size. On palpation, left testicle of normal consistency, larger than right. On antero-interior surface are felt tumors, varying in size from a lentil seed to a large pea. The tumors are movable in relation to both testicle and scrotum. On upper part of testicle, where the epididymis is normally situated, is a tumor, size of a large hazel-nut, knotty, irregularly spherical. It is movable and is sharply distinguished from testicle and scrotum. Spermatic cord, which feels normal, runs into tumor. Operation showed that the small tumors were in the tunica vaginalis, covering the epididymis and upper part of testicle, while the large tumor was separate. As the vas deferens was involved with the smaller tumors, the testicle was removed. Upon examination, two nodules, size of lentil seeds, were found in the testicle itself, in addition to those recognized before operation. Microscopic examination showed fibrillar connective tissue running in bundles throughout the entire tumor, with spindle and round cells, the latter most marked along the course of the vessels.

Reclus⁷ and Melchior⁸ report cases of small, floating

bodies in the tunic following hydrocele treated by irritating injections Quite recently, in operating on an old case of hydrocele, I myself dissected out a thickened tunic which was studded with small, fibrous nodules In this case there was no history of previous treatment by injections These cases, while hardly analogous to the one under discussion, are yet of interest as showing the importance of irritation as a factor in the production of these growths

The following conclusions may be drawn

1 That, like other serous cavities, the cavity of the tunica vaginalis may be the seat of fibrous growths

2 That irritation is an important factor in their production

3 That they spring originally from the subserous connective tissue, but may become detached and lie loose in the cavity

4 That they are mostly of the variety known as soft fibroma

5 That they are prone to myxomatous and fatty degenerations

6 That the testicle may be affected by the same forms of degeneration

7 That the growths are generally minute, the present case being unique both as to the number and the size of the tumors

8 That excision is the only effectual remedy

9 That, as the testicle is liable to be affected, the propriety of removing it with the growths should be considered

BIBLIOGRAPHY

¹ Balloch Relative frequency of fibroid processes in the dark-skinned races, *Medical News*, January 13, 1894

² Curling Transactions of the Pathological Society of London, Vol 11, p 249

³ Holmes Ibid, p 247

⁴ Jessop Ibid, p 249

⁵ Chambord Thesis, Montpellier, 1864

⁶ Tikhonovich Khirurgia, Mosk, x, 630

⁷ Reclus Bull Soc Anat de Paris, 1875, 1, 327

⁸ Melchior Gazz Med Ital Lomb, Milan, 1852, p 51

ON COSTAL AND THORACIC RESECTION FOR PYOTHORAX.¹

WITH SPECIAL REFERENCE TO THE EXPLORATORY METHOD

BY CARL BECK M D ,
OF NEW YORK,

Professor of Surgery in the New York Post-Graduate Medical School and Hospital,
Visiting Surgeon to the St. Mark's Hospital and the German Poliklinik

At the Ninth Congress of Internal Medicine, Ziemssen and Ewald said, "Old cases of pyothorax should not exist, and when they did, the attending physician should be held responsible for their existence" This may be a rather severe verdict, still, in a way, it expresses the truth

The histories of old pyothorax observed by me during a period of twenty-two years in New York City invariably reveal the fact that thorough evacuation of the pleural effusion was omitted at an early stage, that is, until after the expansion power of the lungs was materially impaired

In the great majority of these cases aspiration therapy was continued for weeks before radical steps were taken In some cases a simple incision had been made, in a smaller number procrastination went so far as to look for healing by the development of a so-called empyema necessitatis, and in a few cases surgical therapy was not considered at all because the pyothorax was supposed to be of a tuberculous nature

It may safely be assumed that in all these cases, except those of tuberculosis, recovery could have been expected after timely and thorough evacuation, *i e*, by primary rib resection And while the prognosis of tuberculous pyothorax is grave, yet recovery took place in a number of cases treated by extensive thorax resection, as will be shown farther below Similar principles apply to the treatment of pyothorax in which other

¹ Paper read before the Surgical Section of the Academy of Medicine, December 4, 1903

pathological conditions prevailed, like emphysema, for instance. The presence of complications of this kind naturally delays the healing process, even after early resection. There are several cases of this kind on record. Under such circumstances, which must be regarded as exceptional, early resection even of the thorax wall may be indicated.

As a rule, the expansion power of the lungs can be estimated at the time of the primary rib resection. If the case is of long duration, if the history points to the presence of complications, and if the diaphragm fails to rise and the pulmonary pleura approaches the thoracic wall to a limited extent only, the resection of a small piece of rib is insufficient, a multiple resection being then imperative. And if the costal pleura appears to be fibrous, thoracic resection should be substituted for simple costal resection. If the condition of the patient does not permit of so extensive a procedure, the typical primary rib resection should be performed with a view to undertake the thoracic resection a week later, when the patient has become more resistant.

Early primary rib resection is advisable for many reasons. The main one is that it is unsurgical to treat abscess of the pleural cavity on principles which differ from those governing us in the treatment of other abscesses. Modern surgery treats abscess cavities by free exposure and gauze packing. While it is not denied that a cure can be effected by aspiration, especially if the effusion contains no solid elements, it remains a hazardous procedure as long as the presence or absence of such elements cannot be determined.

In 55 per cent of my cases solid masses were found in the abscess cavity. These could certainly not be aspirated. Now, if any of our diagnostic means could enable us to know whether such were or were not present, it might appear more justifiable to recommend free opening only in cases where solid masses are present, and to try aspiration when they were absent. But as long as we possess no other means, mechanical or speculative, to make this differentiation, save by making a free opening, we have to choose the method which guarantees the

removal of the solid masses, and if a case which would have recovered by simple aspiration should undergo the more radical procedure of free opening, it will certainly get well just the same

The simplicity of the aspiration technique is tempting. It is natural, therefore, that it finds its most enthusiastic advocates among the large contingent of the surgical amateurs who enjoy the prerogative that they never need the aid of a surgeon. They are generally the same who pride themselves with seeing all their cases of appendicitis recover "without being interfered with by the surgeon." When they aspirate, they draw as much pus as they can, the patient is then greatly relieved, and is so enthusiastic in praising this simplified treatment, that it would be simply impossible for a surgeon to persuade him to undergo such a "mutilating operation" as free opening. If the pus accumulates again, the patient gladly submits to a second and even to a third or fourth aspiration, because "a stab with a needle is no operation." But the solid masses in the pleural cavity cannot be withdrawn through the caliber of the aspirating needle, nor will they be absorbed. So the aspiration is repeated until much precious time is wasted, the patient becoming emaciated and the lungs contracted. Then, as a last resort, a free opening is made, which at this late stage often will not serve to prevent the fatal outcome. From this experience the aspiratory enthusiast concludes, of course, that free opening, particularly the resection treatment, yields a bad prognosis, as he, at least, "never saw a good result from it." These same operators would give up aspiration could they once see the solid masses in the pleural cavity. But unfortunately they never see an opened thoracic cavity, at least not at the early stage of pyothorax, and so they naturally conclude that such masses exist only in the imagination of some surgeons.

Aspiration should be reserved exclusively for exploratory purposes, for the cure of seriothorax, and as a preliminary procedure where patients are extremely exhausted. In such cases however, the apparatus of Bulau should be used.

As to the definition of seriothorax, it may be said that such

effusions must be called serous which, although containing a small amount of pus cocci, still show the light color and the characteristic consistency, while pus represents a yellow, thick, homogeneous fluid. In practice, the differentiation should be made only macroscopically.

In 1879 Baelz advised the combination of aspiration with irrigation. The wish was the father of the thought, and it was certainly a splendid idea to try to wash out the solid particles from the pleural cavity. But these masses are unfortunately of too large size to be forced through the cannula of a trocar, so that this method, which was received with great enthusiasm, dropped into disuse.

The so-called Bulau's or suction method deserves attention. It is far superior to simple aspiration in that it aims to prevent refilling of the pus after aspiration. The technique of this method consists in introducing through the intercostal space a large trocar, from which the stylet is withdrawn, only the cannula remaining.

After a rubber drainage tube is pushed forward through the cannula into the pleural sac the cannula is removed. The tube, which must remain *in situ*, is then fastened to the skin with adhesive plaster and connected by a glass cannula with a long rubber tube. The rubber tube ends in a glass vessel filled with bichloride of mercury, where it is kept by attaching a piece of lead to its end. The glass vessel may be represented by a bottle, which the patient can carry around in his vest-pocket. The advocates of this method claim that a permanent evacuation proportional to the expansion of the lungs is thus achieved.

Brilliant as this method appears on a superficial contemplation, it has many and great disadvantages. First of all, the same objection as against simple aspiration must be raised, namely, that the solid masses cannot be removed by suction any better than by simple aspiration. Even the advocates of this method admit that the drain is oftentimes obstructed by fibrinous coagula. Fever is nearly always present on account of pus retention. It is but a small consolation that, by the introduction of instruments and frequent irrigations, this per-

petual obstruction can be removed, and that in the course of time the solid masses become liquefied

Another very disagreeable feature of this method is that the drainage tube becomes loose in the wound-canal, which will finally suppurate, and then, of course, the seclusion from air is no longer hermetic. When the adhesive plaster becomes loose, the drainage tube is apt to fall into the cavity, and the only way to remove it is by free opening. I have seen a number of cases in which such accidents happened after Bulau's method was used.

It is furthermore to be remembered that all such patients require much more careful watching than those under radical treatment. In fact, the control must be so strict that it can be well carried out only in a hospital.

In cases where the intercostal space is narrower than usual, a small drainage tube can sometimes be introduced only with difficulty and after much annoyance to the patient, so the suction method should be reserved for very emaciated patients, and then used only as a temporary resort.

Simple incision through the intercostal space has still many advocates, for the reason that in the majority of cases it is undoubtedly effective. It is also claimed that a small incision, which permits of the introduction of a small-sized drainage tube, fully answers the purpose of evacuation and of drainage, and that any general practitioner could make the incision, while resection is regarded as a difficult operation, which would require the well-trained skill of a specialist. Resection should be reserved, therefore, as a last resort only in cases where, after several months of unsuccessful treatment after the incision method, the ribs have approached each other to such a degree as to render the drainage imaginary.

Modern surgery, on the contrary, prescribes that the opening into an abscess cavity should be made as broad as possible. The cavity should be exposed to such an extent that it can be inspected thoroughly, that its walls can be palpated, and that its lining membrane as well as necrotic tissue (the latter often being present) can be removed. It is only after such rigorous

procedures that the surgeon is satisfied that the evacuation is thorough. The wound discharge will be scant, and will be taken up by the gauze introduced into the cavity. No retention is to be expected, and, as a natural sequence, a perfect and quick recovery may be looked for. It would not be expected that a surgeon should "lance" an abscess anywhere else, or introduce a drainage tube, the use of which would also imply the necessity of daily irrigations. And why should a pyothoracic cavity be treated on different principles from other abscesses?

Again, after simple incision the field of operation cannot be inspected at all. No method except resection enables the surgeon freely to introduce his finger, which procedure renders examination of the cavity possible and at the same time permits of thorough evacuation. Only if the intercostal space is very wide, which is never the case in children and seldom in adults, can the surgeon's finger be introduced, and if the opening permits of this, the finger is greatly restricted in its exploratory motions, and only small solid masses can be removed. Large masses will remain. Adherent clots cannot be detached from the pleura, nor can very large masses of them be reduced inside of the cavity, so as to make it possible to wash them out by a subsequent irrigation. So these masses have to undergo decomposition, retention of pus, of course, always being present, and are dissolved or liquefied under constant febrile elevations, when, at last, they may be washed out,—provided the patient holds out so long.

As regards the alleged difficulty of resection, the surgeon performs many an operation more difficult than that of rib resection. Interference with the intercostal artery happens much more frequently in simple incision than in resection, on account of the situation of the artery below the inner surface of the rib. In resection, the incision is made only as far as the periosteum. So far there are no vessels of any importance. Then the further procedures can be carried out with blunt instruments. The tissues in which the artery is embedded are pushed aside, so that it can be easily seen and avoided. If it chances to be severed during incision, resection must be done

at once, and in such case, if the operator is very nervous, the patient may bleed to death before it is completed. Fatal hæmorrhage from the intercostal artery after incision is reported from several clinics (Billroth). If, however, such an accident should happen after the resection of the rib, the artery can be readily caught. Often the ribs move together after simple incision. Then the further introduction even of a small drainage tube becomes impossible. This condition prevails in the majority of cases. In fact, it represents the omnipotent *vis medicatrix naturæ*, the effort of nature to diminish the extent of the cavity. But, unfortunately, the intended remedy in such cases is nothing less than a prevention of the cure, because it obstructs the opening.

So far there is no method which shows with any degree of probability before operation whether such fibrinous or cheesy masses are present. All we know is that the streptococcus has a predilection for solid masses. Yet in some of my own cases streptococci have been found where no solid masses were present. A large opening, which can be insured only by the performance of a resection, allows inspection and palpation of the cavity and represents the only means to diagnose the presence of the solid masses. So long as we can get no information about this most important point by other methods, resection should be preferred for this reason alone.

Even if performed late, in an emaciated patient who has been weakened under expectant treatment, whose lungs have lost their contractility after so long a period of compression, while the functions of the neighboring organs are impaired by the long duration of their displacement, resection will often still avert the fatal result. There are in fact no contraindications for rib resection in pyothorax, while in those unpardonable cases of long standing, where the patient has become weak and cyanotic, the pulse being small and frequent, a preliminary aspiration may be done for temporary relief, and resection on the following day or later.

In all cases of pyothorax, therefore, no matter how desperate they may sometimes appear, the resection of a piece of rib

should be performed. Cures have been effected even in cases when there seemed to be no gleam of hope. Even when the tarrying policy, "*la médecine expectante*," had caused amyloid degeneration of the liver, ascites, etc., entire restoration to health has sometimes followed the resection treatment. Amyloid degeneration on this basis must not be regarded as a hopeless condition, especially in children.

In tuberculous cases cures are reported by Schede, Gueterbock, Kuster, Rydygier, Hofmokl, Th. Weber, Koranyi, and myself, after very free rib resection. In view of the absolute hopelessness of tuberculous pyothorax, if left alone or treated medically, even a much smaller percentage of cures, as reported, would very positively indicate the resection treatment. It would also be of great benefit if such patients were operated upon much earlier, the chances being then much more favorable.

While primary miliary tuberculosis as well as pyothorax, caused by the perforation of tuberculous cavity into the pleura, gives a very poor prognosis, those cases in which the pleura has been infected from tubercular lungs show a considerable percentage of cures. Mixed infection is generally present in cases of this variety, the pneumococcus, staphylococcus, and streptococcus being also found.

While the tubercle bacillus was not found in the pyothoracic effusion of a considerable number of these cases, the presence of tuberculosis could be well proven by other than bacteriological means of investigation. In other words, the absence of the tubercle bacillus does not prove the absence of tubercular disease. So, as long as our diagnostic means in this direction are not absolutely reliable, the surgeon will always be on the safe side by operating upon every pus accumulation in the pleural sac, whether tubercular or not.

In double tuberculous pyothorax, of course all radical steps should be omitted.

The persistence of a thoracic cavity, whether it be simple, complicated, or tuberculous, must necessarily lead to a fatal end. The better the patient is situated, the longer the inevitable outcome may be postponed, but this is only a question of

time It is difficult to understand, therefore, why expectant treatment is still preferred to timely resection

As said already, the pulmonal tissues as well as the thoracic parietes lose their elasticity After a long continuance of the inflammatory irritation, the pleuræ become thickened and infiltrated, so that the costal pleura finally becomes so hard as to seem like an osseous coat-of-mail At the same time the persistent and abundant suppuration causes amyloid degeneration

In those exceptional cases where the lungs have not completely lost their elasticity, an effort may be made with the apparatus of Peirhes, which permits of continuous aspiration But, as a rule, the pulmonal pleura becomes immovable, the lungs fixed and inexpandible, while at the same time the chest wall does not show any tendency to collapse To enforce this collapse of the chest wall has been the aim of the various operative procedures advised ever since Gustav Simon made the first suggestion of multiple rib resection While the merit of Estlander, whose name is generally identified with this method, should not be underestimated because he developed the principles of Simon, the latter is, as the record clearly shows, the father of the ingenious idea

The practical advantages of the Simon method are small, however, as their indications are limited, for the reason that the pleuræ are left untouched Even Kuster and Estlander, who extended the operation, did not recognize in the thickening of the pleura the main obstacle for the healing process They maintained that the pleura should be a *noli me tangere*, and that the pleural wheals were useful and necessary for the formation of adhesion between the pleura The genius of Schede recognized this fact on which the principle of resection of the thorax is based, in other words, that since the pleuræ represent a coat-of-mail as firm as osseous tissue, they must share the fate of the ribs, *i e.*, removal Simon's original idea thus formed the stepping-stone for the more perfected method of Schede

This principle is represented in practice by the exposure of the cavity through an incision reaching from the fourth rib,

running in a curve downward to the posterior axillary line on a level with the tenth rib, and then up again in a curved direction on the medial side of the scapula. In this way access is gained to the largest cavities.

While the principle of Schede, as far as the removal of the pleural tissue is concerned, must be held as irreproachable, there are some objections to his technique. First of all, the fact must be considered that most of the cases of old pyothorax do not need so severe a procedure, in other words, that Schede's method reaches beyond the mark. It is, in fact, in its general execution one of the severest of operations, and it offers no little danger to the patient who is already weakened through prolonged debility. It is also to be remembered that it is performed not only by the skilful hands of its inventor, but also by the average surgeon, and *si duo faciunt idem, non est idem*.

As a matter of fact, modern surgery does not present a suitable field for the development of typical operations. Even the fundamental principles of incision for amputation, sacred for thousands of years, and formerly the *pièce de résistance* of the old masters, have become shaky, the surgeon generally adapting himself to the individuality of the case. And if we consider that old pyothoracic cavities show a many-sided picture which even the all-penetrating Röntgen rays cannot faithfully portray, it becomes evident that a typical method of resection is only advisable in a minor number of cases. Of course, we can measure the extent of the cavity by pouring in fluids, and the Röntgen rays give us an inlook after the infusion of iodoform glycerin which increases the shadows. Skiagraphy also proves uniform opacity in necrosed conditions of the pleuræ, while fluoroscopy shows the mobility of the ribs considerably interfered with. But all these indications, while of great academic interest, do not give the data for a detailed plan of resection.

Probing is extremely uncertain, because the cavity is generally irregular, the fistulous tracts are generally twisted and often of a meandering nature. The probe thus being arrested by projecting pseudomembranes, it is an altogether unreliable

indicator of the topography of the cavity. The consideration of the deficiency of our exploration methods has led me to employ methods of procedure which are intended to fit each individual case, in other words, to perfect the plan of operation while operating. A large exploratory incision should precede the operation, the details of which will then be dictated by inspection and palpation.

Exploratory incision in diseases of the pleura was performed by me with good results in June, 1894. (See "Exploratory Pleuotomy and Resection of Costal Pleura," *New York Medical Journal*, June 15, 1895.) In the first case observed by Dr. I. M. Rottenberg, of New York City, fibrous degeneration had taken place on both sides of the pleura as a consequence of a long-standing inflammatory process. Considerable respiratory disturbances were caused, which could not be explained satisfactorily. The exploratory resection of a rib in the region of dulness, proceeding slowly and gradually, not only discovered this condition, but also remedied it by removing the enormously thickened layers of the pulmonary pleura.

The experience gained in this case induced me to try the principle of gradual and methodical procedure in cases of old pyothorax, and with gratifying results, as described in an essay on Pyothorax, in the *International Medical Magazine*, January, 1897.

The *modus operandi* of this exploratory method consists in resecting the rib which lies approximately in the middle of the roof of the cavity, regardless of the pleural fistula, as illustrated by Case I, for instance. The fistula is utilized for the passage of a sound, but during the operation itself it is avoided, as in old cases osseous projections are formed around the fistulous tract which make the direct method difficult (see Fig. 5), most of them being more easily reached from the side. The pleura underlying the resected rib is now incised. By means of a lateral incision enough room is gained to inspect a large part of the cavity and to palpate the cavity walls. The use of the pleural speculum originally advised for primary resection is not necessary in such cases (Fig. 1).

If the cavity is small and the patient is in a fairly good condition, which is exceptional, then the next two or three ribs are resected from the vertical incision in proportion to the extent of the cavity beneath, while the soft parts are held back with sharp retractors. The costal pleura is then excised by means of a blunt-pointed knife. If the fibrous tissue is very hard, then the lumen of the intercostal arteries is so much diminished by compression that the hæmorrhage can be regulated by temporary pressure. Then soft parts and ribs may be divided at the same time. Although this formation of wheals is to be most expected in very advanced cases, one should not rely too much upon such helps of nature, but make sure by means of a temporary prophylactic ligature en masse. This is carried out best by the aid of a large aneurism needle. In more extensive cases the ribs are divided successively in the same manner, the presumptive length of each piece is ascertained by palpation as it is incised. Palpation also tells whether the pleura below the ribs is still elastic or must also be sacrificed. The incision of the soft part proceeds likewise, which results in a very irregular looking flap. But no particular attention needs to be paid to the shaping of the latter, as it must depend more or less upon that of the cavity. Accordingly, cross-incisions may also be made. If a portion of the scapula is found to be in the way it is excised.

The muscular flap set free by the resection of the scapula can be utilized for the purpose of partially filling up the underlying cavity.

A mentionable point, to my knowledge not yet presented in literature and not of rare occurrence, is the concave arrangement of the lung surface which overbridges a certain amount of the cavity. The lateral parts of the pulmonary pleura succeed here to attach themselves to the costal pleura, fibrous adhesions holding them there. But the middle portion does not follow, and now it represents the floor of the cavity over which the approximated sides form the roof. The picture of this remarkable condition can be compared with that when one presses in the lung surface with the thumb so far that the sides of that segment of the lungs collapse in a ring around it. Then it re-



FIG 1 —Pleural speculum in situ

sembles the longitudinal fold formed of the gastric wall which is united in Witzel's gastrotomy over a tube, so that a canal is made of it

Special caution is necessary at the beginning of the operation. If in a case of this kind we were to incise directly without first exploring the cavity thoroughly after the resection of the first rib, then we should injure the lungs. But if we have located the place of the thin portion where the pulmonary pleuræ join, then it is possible to finish the process by blunt dissection after having carefully divided the fibrous tissues. The lateral portions then gape apart and the circular cavity is transformed into a flat one. Partial decortication is indicated in such a case. It appears that the right half of the lung is particularly prone to this sort of adherence, due perhaps to the presence of the middle segment, which seems to have a desire to heal in the wrong direction.

The fact that the scapular region is the predominant seat of old cavities explains some of the technical difficulties incurred in the attempt to produce an artificial collapse of the chest wall. While in 21 per cent of my cases the anterior, and in 8 per cent the lateral, thoracic region was affected, the posterior area figures with 71 per cent. If it is considered that the posterior chest wall excels in firmness and rigidity, it will be understood that its collapse is produced with more difficulty than in front. Consequently, cavities show a much greater tendency to establish themselves there. It is evident that the artificial collapse can only be effected if all obstacles are removed, in other words, if the portion of the scapula which may prevent access to the underlying cavity is also eliminated.

Similar principles apply to the apex of the pleural cavity, which is not at all touched by Schede's procedure. Just as in the scapular region it is only the removal of the cavity roof which makes a cure possible. The vicinity of the subclavian vessels produces a risk of drawing the upper ribs into the field of operative measures. The following procedure has done me much service in the resection of that point of the costal dome which covers the pleural cavity. I would like to recommend it on account of its simplicity and comparative safety, and

because it can be performed to a limited as well as to a large extent, just as the individuality of the case demands it

With the arm at right angles, the incision is led close to the lower border of the pectoralis major muscle in a horizontal direction till it ends at the lower part of the anterior margin of the deltoid muscle. The muscles are then dissected back superiorly until the axillary region is free. The vessels and muscles are grasped by strong blunt hooks and pulled upward. Sometimes separation is possible only by the aid of lateral incisions into both pectorales. Thus the vessels are temporarily put *hors de combat*, and the ribs can be removed according to the indicated principles. If it is very difficult to reach the first rib by means of the pectoro-axillary incision, then the clavicle is to be resected temporarily.

The decorticated flap is then trimmed and placed on the pulmonary surface of the pleura. If pieces of the pulmonary pleura have been removed, agglutination is much easier. In my aforementioned monograph (January, 1897) I laid particular stress upon the fact that the callous areas of the pulmonary pleura should also be removed. This is not easy in debilitated patients. But whenever possible, the operation should be finished in one séance, for a later supplementary operation always partly destroys the fruits of the first. Of course, in a case of doubt, we rather sacrifice them for the patient's safety.

This kind of decortication we gain by flat, saw-cutting incisions similar to the method of preparing microscopical sections. The principle is akin to that of the temporary resection, followed by decortication of the pulmonal pleura, as advised by Fowler and Delorme. But it is not practised methodically as advised by these authors, and only as the necessity arises after the exploratory section, and then as a supplement to the resection of the costal pleura.

Great credit is especially due to Fowler for the ingenuity of his procedure and "it would be a consummation devoutly to be wished" that the lungs would follow the wish of the operator. But clinical experience shows that it is only in a small series of cases that the lungs expand fully after the pulmonal pleura is mobilized. Therefore in most cases a resection of the

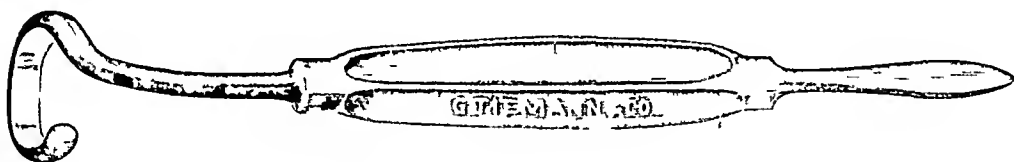
chest wall must be added to decoitation of the pulmonal pleura

Garré (XXVII Kongress der Deutschen Gesellschaft für Chirurgie, 1898) tried decoitation repeatedly, but always with an unsatisfactory result. He also believes that the results of the procedures are entirely due to the interference on the chest wall.

As I see from a later publication, Jordan (*Beitrage zur klin. Chm.*, Band xxxiv) and Kjause (the same, Band xxiv, v. 1) likewise report results from this combination.

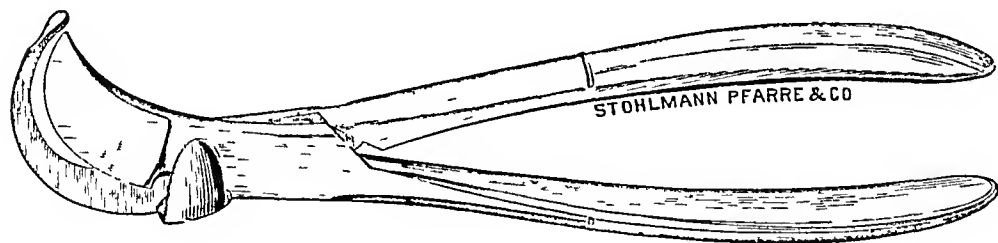
For dividing the rib, I use an annular periostome (Fig. 2) and an elevator rib-shears (Fig. 3). The first is a sort of

FIG 2



aneurism needle, but flat, and formed to embrace the rib, as I might say. After the dissection of the periosteum it serves as a retractor. It is combined with an elevator. The shears can be taken apart, so that both halves can be applied separately as

FIG 3



in the obstetrical forceps. (The instruments are pictured in the *New York Medical Record*, May 19, 1894, and the modifications in the *Journal of Surgical Technology*, December, 1900.)

The same principle was obviously applicable to the treatment of lung abscess, and therefore I recommended the exploratory pleuro- and pneumotomy in cases in which other methods, especially aspiration, gave no results. (See, on the diagnosis and treatment of abscess of the lung, *New York*

Medical Journal, August 28, 1897) Later, Tuffier reached the same conclusion. Of course, the use of the Rontgen rays has facilitated the process of locating the abscess. But the carrying out of the operative plan will have to shape its course in ac-

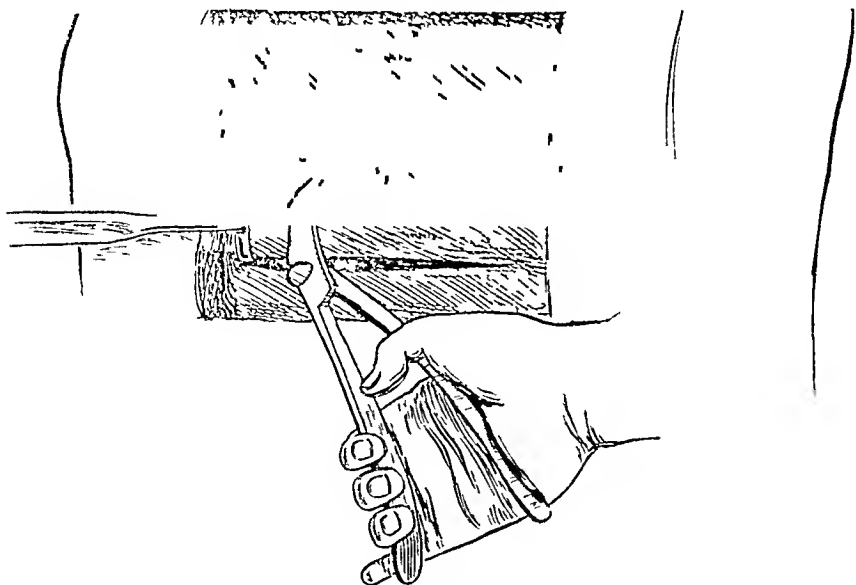


FIG 4—Annular periostome retracting soft tissues while the shears divide the rib

cordance with the principles pointed out. The cavity is packed with iodoform gauze. Immediately after the operation this is done tightly, later on loosely. Then drainage tubes, enveloped by iodoform gauze, may also be used. Thus irrigations are not only rendered unnecessary, but are in fact harmful.

During the after-treatment stress is to be laid upon early gymnastics, which favor expansion of the lungs. To this end I recommend dumb-bells and practice on a bugle. The regeneration of the resected ribs is illustrated by the Rontgen rays (Fig 5).

As illustrated in my previous essay (*International Medical Magazine*, January, 1897), the Rontgen rays offer splendid means of studying the various stages of bone proliferation after resection.

The photographs (Fig 6) (a) represent the results of such processes, as, for instance, showing synostosis around the drainage tube so that a complete bony canal was formed, (b) shows synostosis without channel formation, and (c) illustrates

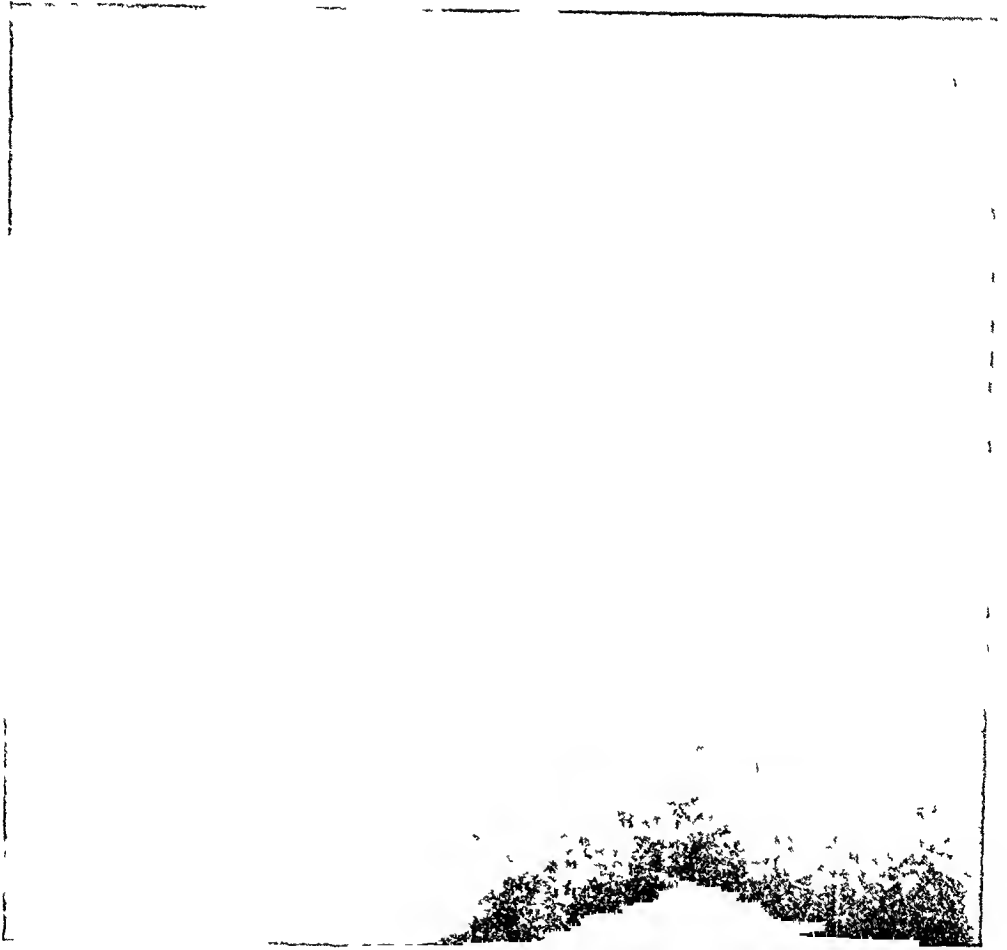


FIG. 5—Regenerative process after resection of the fifth, sixth, seventh, and eighth ribs and of a portion of the scapula.

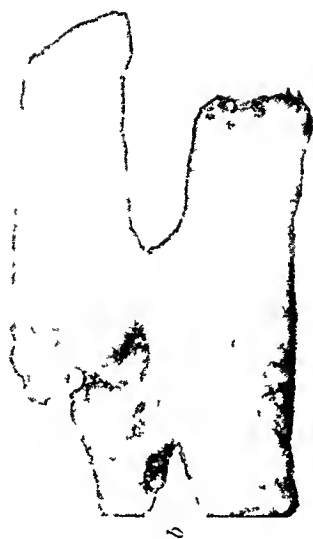
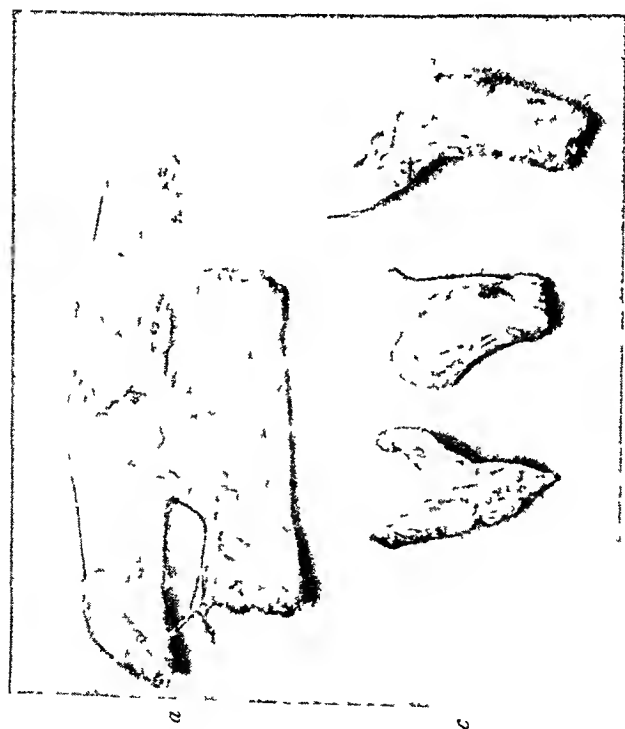


Fig 6 --a Synostosis around drainage tube, b, Synostosis without channel formation, c Staphylococcal formations

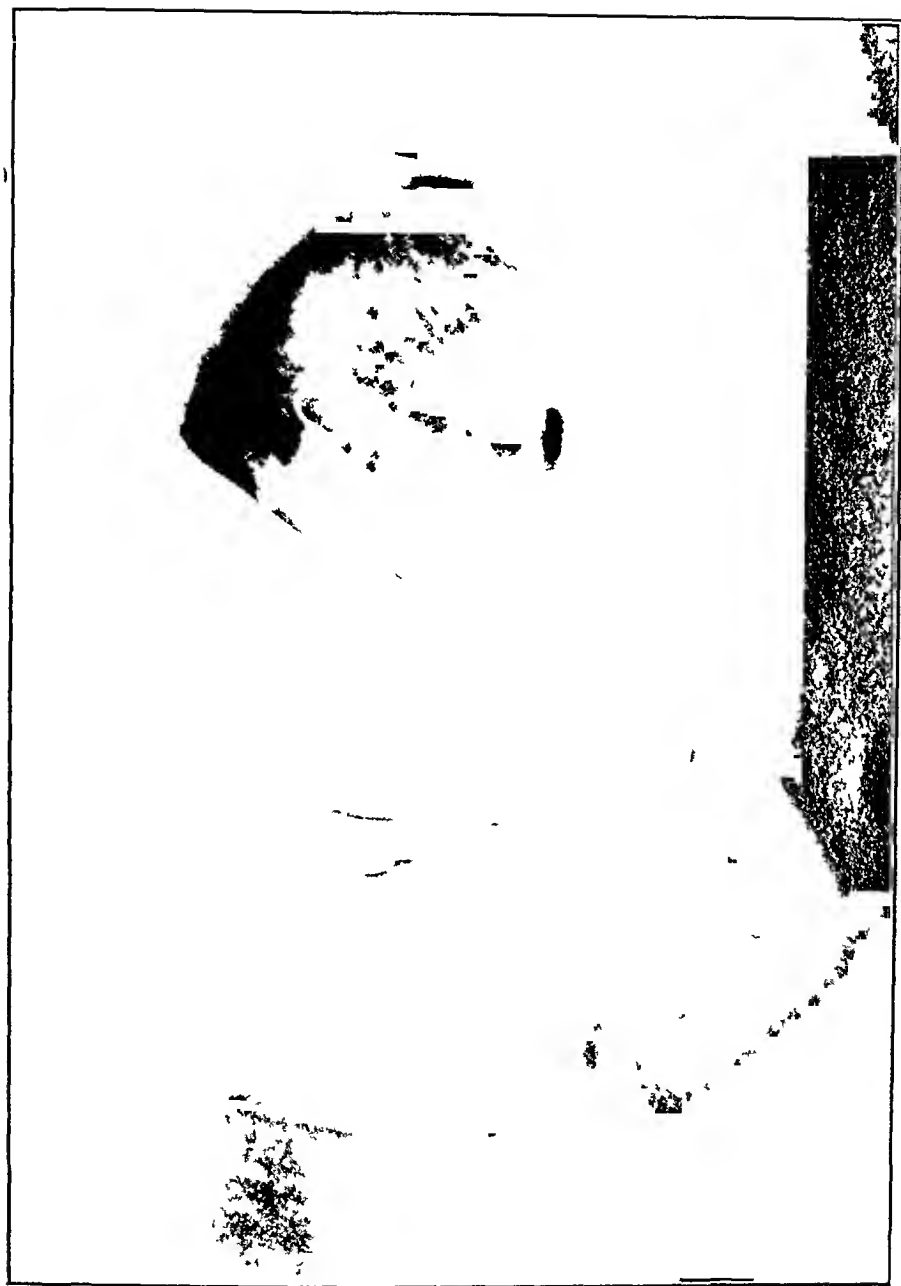


FIG 7—Exploratory incision line above the fistula



FIG 8 —Result after Schede operation

the stalactite-shaped formations obtained from old fragments. The skiagraph (Fig 5) illustrates similar formations two months after resection.

The development of these irregular masses deserves close consideration. Their shape is apt to injure the pleura, which teaches the necessity of methodical exercise at an early period, that is, of forcible inspiration as long as the area in question is soft and yielding. In other words, there is deposition of calcareous matter in the regenerating bone tissue.

As to the inflammatory irritation as an induction to this abundant osseous formation as well as to the inflammatory atrophy causing translucency of the ribs, I may refer to "The pathologic and therapeutic aspects of the effects of the Röntgen rays," *Medical Record*, January 18, 1902."

Schede's advice as to the outlining of the skin-flap has been modified by Helferich, Sudeck, and Tietze. In suitable cases these modifications yield good results. But none of them can be utilized as a general method.

As an illustration of the views expressed, the following cases may serve.

CASE I represents a boy of six and one-half years, who, as reported, took sick with pleuropneumonia in March, 1900. In April an incision was made, which was followed by great improvement. A fistula, however, remaining, rib resection was performed in May, 1901. But the lungs did not expand, nor did the chest wall collapse farther, so that on October 2, 1902, I resorted to thoracic resection, the seventh rib being resected first. After free access was gained to the cavity, the remnants of the eighth rib, which surrounded the fistulous tract, were removed. Then followed the excision of a large portion of the fifth and sixth ribs, as they were overlying the cavity, and the removal of the lower area of the scapula together with the respective pleural areas.

The hæmorrhage was very moderate. No stimulations were necessary, and recovery took place without reaction.

The skiagraph (Fig 5), taken two months after operation, shows the extent of the resection as well as the proliferation of

the rib stumps Although there is a deep depression left, more than a year after recovery, there is no curvature, so that practically no deformity exists (Fig 7)

CASE II represents a man of forty years, who was seized with pleuropneumonia in November, 1899 Aspiration was tried first, later, the purulent effusion was discharged by the incision method The thickened pleura demanded repeated rib resections, altogether four thoracotomies being undertaken Schede's operation was finally performed two years ago (Fig 8) But, although this was done in the most skilful manner, the cavity did not become obliterated, that is to say, the portion of the cavity which could be covered by the horse-shoe flap became considerably diminished in its extent So the surgeon obtained as much benefit from the method as it was able to grant But there still remained an immense cavity above that area When I saw the emaciated patient for the first time, operative exploration in the upper thoracic region revealed the presence of a large and irregular cavity which extended as far as the first rib anteriorly and to the second in the dorsal region The anterior area was exposed first, the fibrous tissue being extensively and atypically removed in order to get better access to the cavity, so that the wound treatment could be done more effectively The patient improved soon afterwards, so that his condition permitted of a more severe interference The upper four ribs were then exsected after access was obtained by the pectoro-axillary incision described above This resulted in considerable collapse of the anterior chest wall, which was gradually followed by the obliteration of that portion of the cavity (Fig 9) Nine months ago the removal of the posterior rib portion, together with the lower part of the scapula, was undertaken The cavity has now gradually filled up, the only defect being that the axillary region is not yet covered by skin The patient's general condition is excellent There is, of course, marked deformity in proportion to the enormous collapse of the chest wall But the patient's attitude is straight, nevertheless (Fig 10) I attribute this to continuous exercise The skiagraph (Fig 11) shows the anterior aspect of the cavity after the first exploratory operation, while Fig 12 shows the rib defect at the posterior aspect It is noteworthy that the bones show the sign of inflammatory atrophy, due to the absorption of calcareous matter, as an expression of which the poor contrast between bony and soft tissues must be regarded



FIG. 9—Result after superior thoracic resection



FIG 10—1 mal result (note small size of left thorax)



FIG 11 —Anterior aspect of cavity

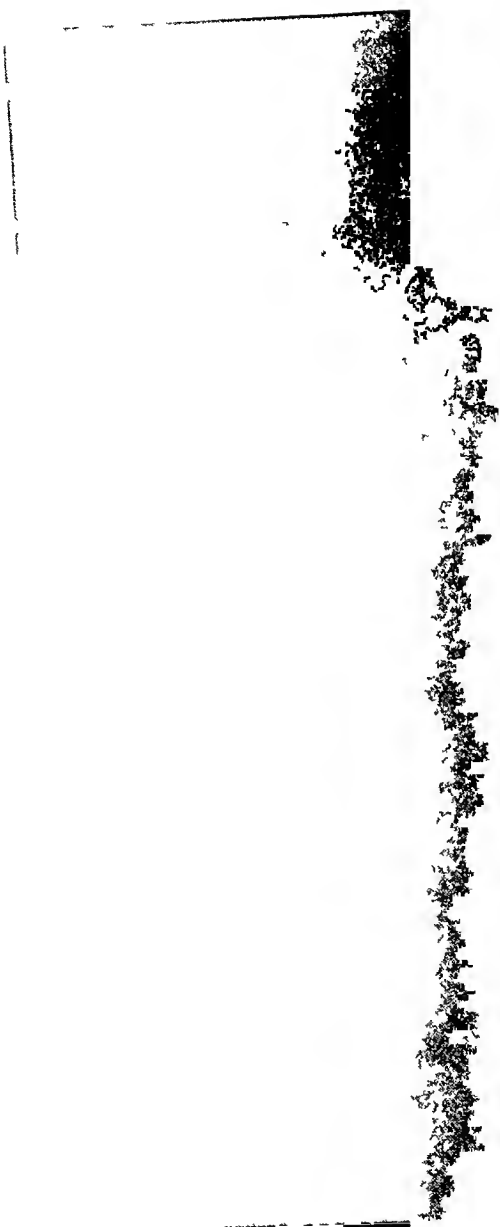


FIG 12 —Posterior aspect of cavity

THE TREATMENT OF PULSATING EXOPHTHALMOS.¹

BY FRANCIS W MURRAY, M D,
OF NEW YORK,
Surgeon to the New York Hospital

THE disease known as pulsating exophthalmos is the result, in the vast majority of cases, of an arteriovenous aneurism of the internal carotid artery and cavernous sinus, in the other cases, which are extremely few, it is due to an aneurism of the ophthalmic artery in the cranium. In about 71 per cent of the cases it follows traumatism, in the remaining 29 per cent its spontaneous origin is due to an existing chronic endarteritis of the internal carotid. Immediately following rupture of the artery, blood escapes into the sinus, and the pressure in the sinus is raised to a degree depending on the size of the rupture. This increase of pressure causes an interference with the venous return through the superior ophthalmic vein, and a state of passive congestion in the territory of the vein follows. The symptoms indicative of passive congestion may develop rapidly or slowly, according as the opening between the artery and sinus is large or small, and as a rule they appear early, but it is some days or weeks before they are fully developed. The characteristic symptoms are exophthalmos, pulsating tumor at the inner angle of the orbit, bruit, and pulsation. The most prominent symptom is the protrusion of the eyeball, which in most cases reaches a high degree. The lids become swollen, œdematous, and discolored, the conjunctiva is chemotic, and its veins are distended and tortuous. If paralysis of the ocular muscles be present, the axis of the eye deviates, and motility is interfered with. Following the distention of the superior ophthalmic vein, its circulation is reversed, and with thickened

¹ Read at the meeting of the New York Surgical Society, November 26, 1903

walls the vein becomes practically an artery, and it forms a pulsating tumor at the upper and inner angle of the orbit. This tumor is soft and reducible, is made up of a mass of pulsating and tortuous veins, and possesses a distinct bruit and thrill. Pulsation of the globe is marked, and in most cases is visible, but it can always be appreciated by palpation. The bruit is of a continuous character and increased at each systole, and is best heard over the globe, the pulsating tumor, and the supra-orbital region. In the eye, the retinal veins are seen to be greatly distended and pulsating, hæmorrhages may occur, and in some cases papilloretinitis is present. Sight may be unimpaired, but later it grows weaker, and blindness may follow. Subjectively, the symptoms are well marked, the patient complaining of severe headache, disturbing sounds in the head, and ringing in the ears, and it is generally for their relief that he seeks help. Momentary digital compression of the carotid on the affected side is followed by the disappearance of pulsation and bruit, protrusion of the bulb lessens, the pulsating tumor sinks, and the subjective symptoms are relieved, but, on removing the finger, the previous condition speedily returns. The sequence of the symptoms may vary, but, as a rule, exophthalmos appears before pulsation. The natural course of the disease, and the ultimate result of the process, if left to itself, or if not affected by treatment, is a steady increase of the symptoms, when, having reached their height, the exophthalmos, the chemosis, and the swollen lids gradually subside, but the subjective symptoms, as well as the pulsating tumor remain, and the eyesight, gradually growing weaker, is finally destroyed. In a few instances spontaneous cure has resulted. The treatment of arteriovenous aneurism of the internal carotid and cavernous sinus presents a different proposition in comparison with the treatment of a similar process in other parts of the body. The indication to be met is different, and we are limited in our choice of a method. In the extremities, for instance, in attempting a radical cure, we can shut off the flow of arterial blood into the vein by means of the double ligature, or we can make use of the quadruple ligature and extirpate the

sac. Such methods are obviously impossible in the treatment of the variety under consideration, and the problem to be solved is the reduction of the pressure in the sinus, so that the passive congestion in the superior ophthalmic vein and its branches may be relieved. The results of autopsies have added nothing conclusive concerning the healing process, but it has been represented as follows. The rent in the arterial wall is plugged with a firm clot, and, in order that it may withstand the pressure of the carotid, a reduction, or temporary abolition of the carotid pressure, is necessary. This is accomplished by ligation of the common carotid, and the blood then coagulates in the artery, as well as in the cavernous sinus, and the superior ophthalmic vein. The clot, thus resting quietly and supported on either side, gains a chance to organize, and by the time the collateral circulation is established, the healing process has reached a point of safety. Healing of the rent in the artery, in this manner, may be possible when the rent is very small and due to disease of the arterial wall, as the local conditions in the idiopathic cases are more favorable for coagulation of the blood. In the traumatic cases, however, such a healing process is not likely, as the arterial wall is healthy, its inner surface smooth and of normal consistence, accordingly the chances for coagulation are not favorable. Healing in these cases is probably from thrombosis, beginning at the superior ophthalmic vein and extending into the sinus, thus giving the necessary lateral support. When the communication between the artery and sinus is large, and rupture follows traumatism, complete closure of the opening by an organized clot is hardly to be expected, as, owing to the collateral circulation, the artery soon refills, and the pressure is greater than the clot can withstand. In many of the successful cases following ligation of the common carotid, the bruit, which disappeared on the tightening of the ligature, returned later on, and in other cases it never completely disappeared. As the bruit, on its return, was diminished in intensity, or had changed the character of its tone, it is evident that the rupture was not completely closed, but rather that the size of the opening was smaller. In these cases it is

probable that the clots deposited on the edges of the rent maintained their position through the reduction of arterial pressure by ligation, and that, by the time the collateral circulation was established, they were so far organized that the healing process could continue. When the healing was complete, the opening between the artery and sinus had narrowed down enough to allow the sinus to carry off the excess of arterial blood entering it, and thus the pressure in the sinus was not sufficient to cause passive congestion in the superior ophthalmic vein. As spontaneous cure is possible, and from the fact that a few cases have recovered under medical treatment, some authorities still advise the trial of local and internal remedies before a resort is made to surgical measures. Such advice is very unwise, since the chances of success are remote, and the time thus spent may result in the serious impairment, if not the loss, of sight. Medical treatment is indicated in cases where the patient is very old, or when the arteries are so diseased as to forbid surgical methods. In the beginning of the disease, when the symptoms are not developed sufficiently to allow of a diagnosis, rest in bed, cold applications, narcotics, etc., are indicated, but when the nature of the trouble is recognized, then surgical treatment should be promptly instituted. As to the surgical methods, we have the choice of compression or of ligation of the common carotid artery. Compression, previous to the days of antiseptics, was considered the safer method, but its results have not been satisfactory, as may be readily understood when one considers the difference which exists between a true aneurism and an arteriovenous aneurism. Its use is limited to the treatment of the idiopathic cases, where the conditions are more favorable for the deposition of clots. Compression with the finger is preferable to an instrument, but the method is always inconvenient, often painful, and its success is dependent on many conditions difficult of control. Sattler reported twenty-nine cases treated by compression, and in only four of them was there a cure. Slomann has added twenty-four cases to those reported by Sattler, making fifty-three cases in all. Of these, fifteen were cured and improved, apparently an improvement on Sattler's

figures, but in Sattler's list there were four cases improved, thus making his percentage 31 to Slomann's 27. These percentages of success are so much less than those obtained after ligation of the common carotid, that the latter method is by far the preferable one. Ligation of the common carotid artery may be said to be the operation of choice among surgeons, and as such is recommended in the surgical text-books. Pulsation and bruit, as a rule, disappear with the tying of the ligature, and the exophthalmos, the chemosis, as well as the subjective symptoms, steadily subside, and in the successful cases cure is complete from within three to six weeks. As previously stated, the bruit in many cases returns, but weaker and changed in character. The results of ligation have been satisfactory, the mortality is much less as compared with the mortality in general of the same operation, and secondary cerebral disturbances are uncommon. The mortality, in general, after ligation of the common carotid, is very considerable, probably above 25 per cent, in exophthalmos following carotid ligation, the mortality is 10 per cent. Secondary cerebral disturbances, the greatest danger attending carotid ligation, occurred in only four of the sixty-three cases reported by Sattler, and in every instance it was an idiopathic case, and the patient a woman. The results of ligation have been collected by Sattler and by Slomann, whose work is a continuation of the former's extensive monograph. Sattler, in 1880, collected all cases hitherto reported, and they were fifty-six in number. The results were, healed, 37, or 66 per cent, unimproved, 11, or 19 per cent, died, 8, or 14 per cent.

Slomann, in 1898, reported ninety-five cases. Of these were, cured, 49, or 51 per cent, improved, 17, or 17 per cent, unimproved, 17, or 17 per cent, died, 10, or 10 per cent.

The term "healed," as used by Sattler, includes those cured and improved. In comparing these lists, it will be seen that the percentage of cured and improved is nearly the same, but the mortality is reduced by 4 per cent. Whether the successes were permanent is uncertain, as in the majority of cases classed as "healed" the patients were lost sight of after their

discharge Bodon, in 1899, collected all the reported cases of traumatic exophthalmos treated by ligation of the common carotid. They were fifty-eight in number, with the following results. Cured, 26, or 46 per cent, improved, 20, or 35 per cent, unimproved, 6, or 10 per cent, died, 6, or 10 per cent.

The results are apparently very satisfactory, as in 80 per cent of the cases the operation was followed by cure or improvement. In six cases blindness resulted, as the operation was done too late. The time of its performance varied from four to sixteen weeks (in one case eighteen months) after the injury. This unfortunate termination in 10 per cent of the cases emphasizes the necessity of an early operation. Four of the six deaths were due to sepsis and hæmorrhage, complications which are less liable in the future, owing to the asepsis of the present day. In comparing the results reported by Stromann with those of Bodon, it will be noticed that the proportion between those cured and those improved is much greater in Stromann's list, and its explanation is due to the fact that Bodon's list is limited to the traumatic cases. Recurrence is much more frequent in the traumatic cases, in the eleven cases of Sattler, eight were traumatic, and is due to the local condition being unfavorable for the deposition and organization of clots about the rupture in the arterial wall. The refilling of the artery, with the accompanying rise of pressure, should take place slowly and gradually, in order that the healing process should proceed satisfactorily. This process, therefore, depends on the rate at which the collateral circulation is established. The later its completion the better the chances of success. After the ligation of the common carotid artery, the collateral circulation is completely established by the free communications existing between the carotid arteries of opposite sides, both outside and inside of the skull, and through the superior thyroid artery of the side on which the carotid has been tied. The superior thyroid artery plays an important part in the establishment of the collateral circulation, and in several cases this artery was found, some weeks after the carotid ligation, to be dilated and strongly pulsating, while in the portion of the common carotid

above the ligature, and in the facial and temporal arteries, pulsation was absent. Legouest (quoted by Bodon) ligated the left common carotid in a traumatic case eight weeks after the injury. No improvement followed, and he then tied the external carotid below the origin of the superior thyroid artery. Improvement immediately followed, the bruit which was present disappeared, and cure was complete at the end of the fourth month. By cutting off the superior thyroid supply, the establishment of the collateral circulation is thereby delayed, and time is gained for the organization of the clots deposited upon the edges of the rupture. Tying the internal instead of the common carotid, therefore, offers a better prospect for success, and, in my opinion, ligation of the internal carotid artery should be the operation of choice. In a number of cases after ligation of the common carotid complete recurrence has followed, the appearance of the symptoms varying in time from a few hours up to ten weeks, in one case not until nine months had elapsed after operation. On compressing the other carotid, the pulsation and bruit disappear, and from this fact the second carotid may be ligated. Bodon, in 1899, collected all the cases on record of ligation of both common carotids for the cure of pulsating exophthalmos. He found five cases, and adding one of Dollinger's there were six cases in all. The first case was that of Gurdon Buck, in which fourteen months elapsed between the two operations. All the symptoms disappeared after the second operation, but sight of the affected eye was lost. The second case, by Foote Williams, the second operation thirty days after the first, complete cure at the end of the fourth week, sight decidedly improved. The third case, by Le Fort, fifty-four days interval, complete cure, patient perfectly well eighteen months after the last operation. The fourth was by Reeve, no mention of time interval, and the result a failure. The fifth case, by Francke, sixty days between operations, gradual improvement, cure complete at the end of a year. The sixth case, by Dollinger, first operation five months after injury, second operation thirty-two days after first, and followed by improvement. In considering these cases, one is impressed

by the fact that the operation was attended with no mortality, and, with the exception of Reeve's case, the patient was cured or improved. In Buck's case, the second operation was performed too late to save the sight, and it is a warning to us not to wait too long before performing the second operation. The ligation of both carotids is apparently not as dangerous as we would imagine, and the absence of mortality in the list reported is explained by the fact that the arteries were not diseased. The final outcome in Dollinger's case is of special interest, as it has a practical bearing on the treatment of pulsating exophthalmos. Ten weeks after the second operation, the severe headache returned, exophthalmos had increased, and at the inner angle of the orbit was a pulsating tumor, compression of which caused a complete disappearance of the bruit and a diminution of the headache. Dollinger, through an incision above the supraorbital arch, tied off several small veins, and then resected about half an inch of the enlarged and thickened superior ophthalmic vein. The bruit immediately disappeared, the headache was relieved, and thirteen days afterwards the patient was discharged cured. Woodward reports a similar experience. After ligation of the common carotid the exophthalmos and subjective symptoms disappeared, the bruit, however, returning from time to time. Ten weeks afterwards the patient returned, complaining of ringing noises in the head, which he could stop by pressure on the nose at the inner angle of the orbit. Woodward then ligated the enlarged veins at the inner and upper angle of orbit, the ringing noises disappeared, and when seen, eighteen months later, the patient was perfectly well. Cure in these two cases was probably due to thrombosis, beginning at the site of the ligature and spreading into the cavernous sinus. These results suggest the possibility of a cure by merely tying off the mass of enlarged and pulsating veins at the inner angle of the orbit, and, if not successful, then the carotid ligation should follow. When recurrence follows ligation of the carotid, it would be well, and certainly safer, to ligate and resect the veins before attempting the ligation of the second carotid.

Slomann, in 1898, collected all the cases of pulsating exophthalmos reported up to that time, including Sattler's cases, and they were 197 in all. After excluding twenty-two cases, in which the characteristic symptoms were in the course of an non-aneurismal disease, and which Slomann designated as "false pulsating exophthalmos," there remained 175 cases of the true variety. From these figures it would appear as if the disease is not uncommon, but, as the number comprises all cases reported during the past eighty-eight years, it will be seen that the disease is rather rare. Consequently, it may be of interest to report a case which was referred to me for operation by Dr. Charles S. Bull, to whom I am indebted for the patient's history previous to his admission to my service at the New York Hospital. It is as follows:

R. M., male, twenty-nine years old, laborer, on the night of January 8, 1902, was struck on the left parietal region with a bottle. The bottle was full of beer, and was not broken by the blow. The patient was not knocked down by the blow nor rendered unconscious, and there was no laceration of the scalp. The next morning he became conscious of a continuous roaring noise in the left side of his head, which rapidly grew and extended all over his head. On the second day the left eye began to protrude and the eyelids to swell. Within a week both eyes showed enormously distended conjunctival and subconjunctival veins, and engorgement of the subcutaneous veins of both sides of both eyes, the engorgement and distention of all the vessels being more marked on the left side. Headache was severe during the first week, this soon abated, and the patient was left with a sense of confusion, which he attributed to the constant noise in his head. He applied at the New York Eye Infirmary early in February, nearly a month after the injury, and the following condition was noted. The left eye projected directly forward, and at least one-half of its anteroposterior diameter projected beyond the plane of the orbit. There was marked chemosis of the conjunctiva and great swelling of the lids, the œdema extending up under the eyebrow, downward upon the cheek, and outward towards the temple. The skin of the lids was of a dusky, purplish hue from obstruction to the venous circulation. The chemosis was most

marked downward and outward. The right eye also protruded slightly forward, but there was no chemosis. The conjunctival and subconjunctival veins of both eyes were greatly engorged and very tortuous. There was a loud bruit heard over the left eye and left side of the forehead and left temple, and this bruit was distinctly audible on the right side of the head, vertex, and occipital regions. There was a distinct pulsation of the left eyeball, perceptible to the eye as well as to the finger, but none of the right eye. There was no interference with the motility in any direction of either eye. The tension of the eyes was normal, normal pupils, and the lids of normal reaction. Vision was 20/20 in each eye, and there was no defect or limitation of the field of vision. The media were clear, and there was distinct pulsation of the retinal veins, which were greatly engorged, but without any accompanying hæmorrhages. He was admitted to the New York Hospital on February 26 for ligation of the common carotid. The symptoms had steadily increased. There was now distinct pulsation of the right eye, and above, and outward to the left eye, a mass of engorged and pulsating veins could be plainly felt. The axis of the left eye deviated outward, and its motility was impaired. On March 1 the left common carotid was ligated above the omohyoid muscle by two medium-sized chromic gut ligatures, three-fourths inch apart, the artery severed between the ligatures. Pulsation and bruit immediately ceased when the ligatures were tied. The exophthalmos, the chemosis, and swelling of the lids gradually subsided, and the patient left the hospital on the tenth day with wound healed per primam. During the stay in the hospital, the engorgement of the subconjunctival veins diminished but little, and was well marked at time of discharge. He was not seen again until February, 1903, nearly a year after operation, and there remained a slight degree of exophthalmos of the left eye, the subconjunctival veins less engorged. Patient felt perfectly well, and there was no bruit or pulsation anywhere to be discerned. The eyesight was good, the retinal veins were engorged and tortuous, and all over the retina of the left eye were the remains of numerous hæmorrhages.

In June, 1903, the patient appeared, complaining that the appearance of his eyes prevented him from securing employment, as their congested appearance suggested a free use of alcohol. Exophthalmos of the left eyeball was more marked, and the en-

gorgement of the subconjunctival veins had increased. Pulsation had returned in the external carotid and in the superior thyroid artery. A large tortuous vein of the forehead was seen, it started at about the supra-orbital notch and ran upward and outward towards the vertex. No pulsation or bruit. Beneath the vein could be felt a distinct fissure, which apparently ran into the roof of the orbit. No subjective symptoms. Further operation was advised, but the patient disappeared, and has not since been seen.

This was a case of double pulsating exophthalmos following traumatism, and apparently cured by ligation of the common carotid artery, but more than a year after operation symptoms of recurrence began to develop. As a rule, recurrence of symptoms after operation appear within a short time, generally a few weeks, and its delay for more than a year in this case is most exceptional. The protrusion of the right eyeball was undoubtedly due to rupture of each internal carotid into the cavernous sinus, and its extension by way of the circular sinus into its fellow of the right side. Double pulsating exophthalmos may be due to rupture of each internal carotid into the cavernous sinus, but generally the rupture is unilateral, and, owing to the pressure extending to the sinus of the opposite side, protrusions and pulsations of the opposite eyeball follow, but less marked than on the eyeball on the injured side. It will be noticed in this case that subconjunctival veins remained distended, while all other symptoms disappeared, and it is evident that the requisite reduction of pressure in the cavernous sinus was never obtained. With the complete return of collateral circulation, as seen by the presence of pulsation in the external carotid and superior thyroid arteries, the sinus pressure increased, and, as a result, the exophthalmos grew larger, the conjunctival congestion became more marked, and the supra-orbital vein made its appearance. The error as regards treatment was the ligation of the common carotid, and, had the internal carotid been tied, the chances of recurrence would have been lessened. Should another opportunity present itself in the future, I would tie the internal carotid. Should the patient re-

turn for operation, I would follow Woodward's example and ligate, and resect the branches of the superior ophthalmic vein at the inner angle of the orbit, and if necessary resect a portion of the main vein. In case of failure, then ligation of the opposite carotid would be indicated. Figs 1 and 2 were taken before operation. The dotted lines in Fig 1 indicate the area over which the bruit was audible. The crosses show the points of maximum intensity. In Fig 2 is seen the extreme chemosis. Fig 3 was taken a week after operation.

REFERENCES

- Brown. *Deutsche Zeitschrift für Chirurgie*, Vol 11, 1899
C S Bull. *Transactions of the American Ophthalmological Society*, 1903
Sattler. *Handbuch der Augenheilkunde*, Graefe-Samisch, Vol vi
L A Stimson. *Aneurism, "System of Surgery"* (Dennis), Vol 11



FIG. 1.—Dotted line indicates area of bruise
Crosses are points of its maximum intensity

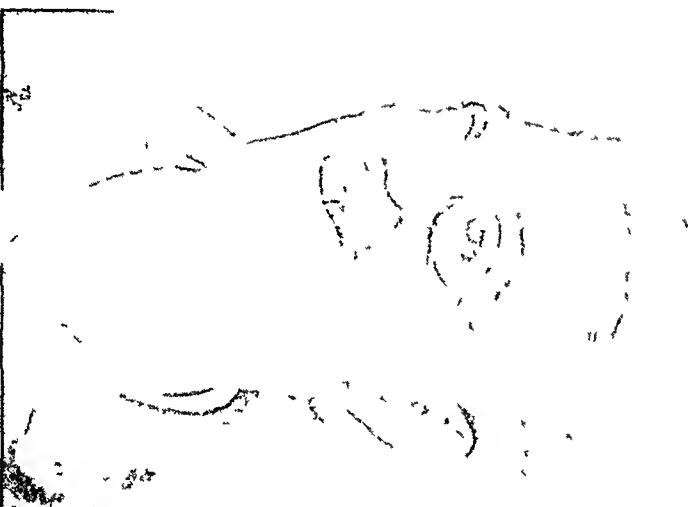


FIG. 2.—Shows the chemosis of conjunctiva



FIG. 3.—One week after ligation of left common
carotid

•

LIP-TIE

BY FREDERIC GRIFFITH, M D ,

OF NEW YORK

THE frænum of the tongue has its counterpart in the lips in a fold of mucous membrane extending in the middle line between the lips and gums of the upper and lower jaws, and known respectively as the superior and inferior frænum of the lips. While cases of tongue-tie are very common, until the present instance occurred I had neither seen nor read in the books of a similar condition of the lip which might well be called lip-tie. The patient was an Italian infant, who since birth presented a condition in which the inner surface along the middle line of the entire upper lip had been bound to the gum by a fold of tissue continuous with the mucous lining of the mouth and about one-eighth of an inch in thickness. The child's teeth are small but well formed, and there is no unusual interval between the upper central incisors. When the mouth is opened the middle of the upper lip is rolled directly inward, giving rise to a peculiar expression not apparent when in repose. The direct family history was negative. Treatment consisted in a cutting through of the partition half-way up its extent with blunt-pointed scissors, without the aid of anæsthesia, and tearing through the remaining portion by the aid of the fingers. Bleeding was momentarily free.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 25, 1903

The President, HOWARD LILIENTHAL, M D in the Chair

SEVERE ELECTRIC BURN OF SKULL AND HANDS

DR OTTO G T KILIANI presented a man, an electric lineman by occupation, who inadvertently grasped a live wire that he had been sent to repair. In his desperate attempts to release his right hand, which held the wire, his left wrist also came in contact with it. He then fell, his head striking the trolley-rail, and for ten minutes he lay there unconscious, with a current of 2750 volts passing through his body. After he was rescued he remained unconscious for three hours. The following day, when he was brought to the German Hospital, he was in a semiconscious condition. An examination showed severe burns covering the right palm and fingers, the left wrist, and the right side of the skull. The ring and little finger of the right hand had been completely severed by the contact of the wire. The patient complained of severe pain throughout the entire body, but especially in the head and hands. Two days later his face became enormously swollen, this was only temporary, and was probably due to interference with the lymph currents (not inflammatory). The mental faculties were apparently unimpaired by the strong current of electricity that had traversed the brain for at least ten minutes. Profuse hæmorrhages repeatedly accompanied the dressing of the burns. The bleeding apparently emanated from the veins and arteries in the granulation tissue, and was probably due to decomposition of the vessel walls. As it was impossible to apply a ligature or control the bleeding by compression, it

became necessary to dissect out the vessels and follow them for two inches or more before they were found sufficiently sound to permit of the application of a ligature. Some of the bones of the left wrist were so severely burned that they had to be removed. The wound on the skull presented a large section of bone denuded of periosteum, the outer plate was found to be necrotic throughout the entire extent of the burned area, three inches by four, a smaller portion of which was necrotic through the entire thickness of the skull. This necrotic bone, representing an oval disc of three by four inches, could be removed by the elevatorium, leaving the dura exposed to quite an extent without difficulty. The wound healed by granulation, and was later on covered with skin-grafts by Thiersch's method.

DR F W MURRAY said that in a case of severe electric burns affecting the face, arm, and leg which he saw at the New York Hospital, the granulations bled very freely when the wounds were dressed. The case resembled that of Dr Kiliani's in this particular, but it was never necessary to tie any vessels.

DR LILIENTHAL said the pain throughout the body that the patient complained of after the injury might be explained by the very severe tonic contraction of the muscles during the time that he was in contact with the electric current.

THE TREATMENT OF PULSATING EXOPHTHALMOS

DR F W MURRAY read a paper with the above title, for which see page 421.

DR LILIENTHAL said that in a case of pulsating exophthalmos which he showed several months ago, ligation of both common carotids was followed by temporary improvement, but it did not produce a total disappearance of the symptoms. The patient, a young girl, still complained of buzzing in the head immediately after the second ligation, which was done within a week of the first, although the nose had greatly diminished. The exophthalmos diminished also, but never entirely disappeared, and the symptoms gradually became worse until within a few months something more had to be done. An Omega-shaped flap was then raised in the temporal region, but on endeavoring to make an exploration with the finger the hæmorrhage was so severe that the wound was packed for forty-eight hours, a thorough exploration was then

possible, and a pulsating tumor could be distinctly felt underneath the dura. It was not considered advisable to interfere with this tumor. The operation relieved the patient to a considerable extent from the headache from which she was suffering, but it had no effect upon the buzzing and exophthalmos. The flap was put back in place and the soft parts healed by primary union excepting at one point left for drainage. Non-union of the bone still persisted, and the entire flap pulsated.

The cause of the exophthalmos in this case, Dr. Lilienthal said, was apparently an arteriovenous aneurism of obscure origin, probably of the cavernous sinus. The buzzing in the head had existed since childhood. An operation for mastoid disease had been done abroad, but this was after the onset of the other symptoms.

As a further expedient in this case, the speaker suggested the possible advisability of injecting gelatin into one of the enlarged veins about the orbit.

Two other causes of unilateral pulsating exophthalmos were referred to by Dr. Lilienthal, namely, a soft sarcoma of the globe and of the orbit. He considered the condition a rather hopeless one at best.

DR. MURRAY said that in the case mentioned by Dr. Lilienthal he would be inclined to expose the large and tortuous veins about the orbit and tie them off. That failing, he would ligate the internal carotids. He had no experience with the injection of gelatin into the enlarged veins, but in a number of cases where this injection of substances causing coagulation had been resorted to bad results had followed. As to the other causes of pulsating exophthalmos mentioned by Dr. Lilienthal, the speaker said that those cases had been classed by Slomann as false pulsating exophthalmos. In these the vein was not affected, and they did not give all the symptoms that were present in the true variety.

VESICAL CALCULI FOLLOWING SUPRAPUBIC PROSTATECTOMY

DR. LILIENTHAL presented a calculus removed from the bladder of an old man who was operated on last summer by another surgeon for an enlarged prostate. The operation, a suprapubic prostatectomy, was followed by relief of the retention. The

patient soon afterwards developed a cystitis, with great frequency of urination. The urine contained considerable pus and mucus, and the patient suffered so much distress that he again sought relief.

Upon sounding, a calculus was found in the bladder. A suprapubic opening was made through the cicatrix and several calculi removed. Each stone contained a nucleus which at first sight appeared to be a bit of gauze, but upon closer examination, after dissolving the calcareous substance with hydrochloric acid, it proved to be a fragment of tissue, very tenacious, fully half an inch wide and about one-eighth of an inch thick. Upon inquiry, Dr. Lilienthal said he learned that the patient's bladder had not been irrigated after the prostatectomy, although it had been drained.

The case illustrated the importance of thorough and frequent irrigation of the bladder after prostatectomy, particularly after the suprapubic operation.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting, November 2, 1903

HENRY R WHARTON, M D, in the Chair

OSTEITIS DEFORMANS

DR JOHN B ROBERTS said that he had reported a case of leontiasis ossium, or hypertrophy of the bones of the face, at a meeting of the Section on Surgery of the College of Physicians of Philadelphia, November 8, 1895 (ANNALS OF SURGERY, 1896, Vol xxiii, p 303) The woman, who was twenty-two years of age, had suffered from the time she was six years old with a slowly increasing enlargement of the upper and lower jaw-bones Such cases are supposed by some writers to be an early stage of osteitis deformans He had unsuccessfully endeavored to find the woman mentioned, in order to see whether there has been any change in her condition that would throw light on the possible relationship of these two disorders of the bones

Leontiasis ossium, sometimes called Virchow's disease, and osteitis deformans, often called Paget's disease, are evidently, in his opinion, trophoneuroses The two conditions are therefore probably related, even if the disease manifested by enlargement of the bones of the face is not actually osteitis deformans, beginning in the facial bones instead of in those of the extremities and cranium He presented an illustration of the face of the young woman ("Deformities of the Face" By John B Roberts Second Edition, 1901, p 19)

Now he reported a case of typical osteitis deformans occurring in a man The patient, sent to him about a year ago by

Dr H E Schlemm, had applied to that physician because of his increasing loss of stature, which had attracted the attention of his friends, otherwise he had, in his own opinion, no special symptoms of illness, except that he had been of late somewhat below par in general health. The bony lesions, other than the diminution of height, had been unobserved.

The gentleman, who was aged forty-seven years, and unmarried, knew of no family history of gout or rheumatism, and had no definite knowledge of any condition similar to his in his ancestors or collateral relatives. His father's father had died at the age of eighty years of cystitis, his father's mother at the age of eighty years of dropsy, his mother's father at sixty of dropsy, and his mother's mother at eighty-two of dropsy. He knows of no instance of bandy-legs or bow-legs in the family, except that his father's father just mentioned is said to have become bow-legged as he increased in age. His father had died at the age of sixty-two years of what was called heart-failure, although there was also a history of some kidney disturbance. Some of the friends of the family say that his father before death walked like the patient. The latter, however, does not know that his father became shorter in stature, but says that he became very bent and stooped. His mother still lives at the age of seventy-two years and is in good health.

The patient has living at this time two sisters and three brothers in good health. One brother died of dropsy at the age of thirty-nine. Ten years previously he had received a shock by falling at a roller-skating rink and fracturing one arm. The patient does not know which arm, or whether the injury was above or below the elbow. Later he had suffered from an injury to the right hip, but there was no fracture at that region. During the ten years from the time of the receipt of the fracture of the arm and his death he gradually became weaker, and had to be rolled about in a chair for three or four years, but he was not paralyzed in the legs. The man was dropsical and swollen and it gave pain to lift him, so that some sort of apparatus was made by which he could be lifted by the attendants.

The present patient does not know that this brother had any tendency to stiffness of the joints at this time, nor that there was any tendency for his bones to bend. The right side of the lower jaw was, however, swollen, and the patient thinks that this

swelling of his brother's face was situated in the jaw-bone. He has no recollection of his brother complaining of pain in the jaw.

The patient is the eldest child of his parents. About fifteen years ago he fractured his left humerus about one inch above the elbow by being thrown from a street car. There was no cutaneous wound. The bone rapidly united, but he dates the beginning of his decline in health from the time of that accident. He has never had any serious disease. There is no history of gonorrhœa or syphilis. He has never suffered from abscess and has never had scrofulous lesions, rickets, or typhoid fever. There is no history of ague, rheumatism, rheumatic pains, or jaundice.

About twenty years ago he had a boil upon his right thigh, but this lesion seems to have been unimportant. About ten years ago he weighed in the neighborhood of 160 pounds, and was about five feet nine and one-half inches in height. Now he measures five feet six and one-fourth inches with his shoes on, and weighs about 150 pounds. His physician says that the patient was very erect in his carriage.

Four or five years ago the patient's friends called attention to the fact that he was becoming shorter. He apparently paid very little attention to this symptom until recently. Since that time he has been taking a month's holiday each year, because he found that he was a little run down in health. His business has kept him a good deal confined to his office.

On examination the patient had a pallid, anæmic look, and gave the appearance of his arms and legs being too long for his body. He said that he had no digestive disturbance, was not constipated, and was temperate in eating and drinking. According to his own statement, the color of his skin was better than it had been for several years. Examination of the lungs was negative, as was that of the heart, except that there seemed to be a systolic murmur, possibly attributable to the excitement of the examination. He, however, said that he got easily out of breath from going upstairs, and that when he walked his knees felt weak. There had been no hæmoptysis. His urine was acid, had a specific gravity of 1026, and was free from albumen and sugar.

He used glasses for reading and had a slight degree of hyperopic astigmatism, his refraction being plus 75 sphere combined with plus 75 cylinder axis 90 in each eye. His hearing and teeth were good. He himself had no knowledge of his change

in stature until his attention was called to it by his friends, though he had been feeling that he was not quite up to his general standard of health

When the patient was stripped, the normal hollow of the back in the lumbar region was gone, and the spine in that location bulged backward just above the sacrum so as to change the normal lumbar concavity into a slight prominence backward. This change was not at all like the angular deformity which occurs in tubercular spondylitis, but was a general bulging backward of the whole region. The femurs, especially the right one, were unnaturally convex forward and perhaps bowed a little outward. The right clavicle, which had never been fractured, was massive, being at least twice as thick as the left clavicle, which seemed to be of normal shape and size. The left humerus was very much thicker than the right, especially in the lower half of the shaft and the condyles. This was the bone which had been fractured years previously, but the enlargement is a general one, and not like that at the seat of an old fracture with displacement and callus. The enlargement of this bone existed in the upper portion to a less extent than in the lower portion. The left tibia had a distinct enlargement in the region of the tubercle, which extended downward in a promontory-like mass upon the front of the bone. The rest of the tibia was normal in size and shape.

There was no stiffness of the joints. There were no gouty deposits in the fingers, toes, or ears. There was no rachitic rosary upon the ribs, and no rachitic-like deposits at the wrists or ankles. Because of the bending of the lumbar region of the spine, the lower ribs and the crests of the two ilia were only about a finger's-breadth apart.

The head looked very big at the back, though he had not been aware of this peculiarity until asked whether he had recently been obliged to increase the size of his hat. He then said that about two years ago the number of his hat was $7\frac{1}{4}$, whereas now it was $7\frac{1}{2}$. There was no enlargement of the jaws or facial bones nor of the hands or feet.

In an article by Dr J. C. Wilson, in the *Philadelphia Medical Journal* of the early part of this year, it is stated that up to that time there had been but seventeen cases of osteitis deformans reported as observed in this country. Hence the report of the

present case, which shows most of the typical symptoms, and differs from most of the cases reported only in the circumstance that the kyphosis, or bending backward of the spine, occurred in the lumbar rather than in the cervicodorsal region

The pathology of the condition is interesting. Microscopical examination shows absorption of healthy bone and formation of new bone coincident with this absorption, but apparently not connected with the absorptive process. The new bone may show a failure of calcification, may itself become absorbed, or may finally become calcified. The condition appears to differ from osteomalacia, because synchronously with the absorption of the bone a process of regeneration takes place, and because, instead of fracture occurring, the bones have a tendency to bend as in rickets. The statement that leontiasis ossium affects the bones of the face only, and not those of the cranium or extremities, does not seem to be verified. On the other hand, some cases of osteitis deformans, it is said, show hypertrophy of the bones of the face as well as of those of the cranium, which is the region of the head that ordinarily is affected. It seems probable that there is some relation between these two conditions and the common disease called osteo-arthritis, rheumatoid arthritis, and rheumatic gout. Acromegaly differs from the conditions under discussion, at least in its clinical manifestations, because in it the enlargement occurs in the feet and hands as well as the head, and seems to involve the soft parts as well as the bones. From a study of the recent articles on the subject, Dr Roberts was inclined to believe that osteitis deformans is a nutritive or trophic disorder, due, as suggested by Prince (*American Journal of the Medical Sciences*, 1902, Vol cxxiv, p 796), to a modification or perversion of the natural processes occurring in normal bones.

DR DE FOREST WILLARD said that, owing to the rarity of this condition, no one physician had the opportunity to make a clinical study of many cases. He has seen but two cases, both being aged women. The pathology of the affection is uncertain. Dr Willard believes that rheumatoid arthritis, osteitis deformans, and leontiasis ossea are in some way related to each other. In all there is a tendency towards the deposit of extra bone and the production of deformities. When the pathology of the conditions in question is ultimately worked out, it will probably be found that, although dissimilar, they all belong to one general group.

DR WILLIAM J TAYLOR mentioned a case of leontiasis ossium that involved the frontal bone. A mass of the new formed bone varying from one to two inches in thickness was chiselled away by Dr Keen. This bone was subjected to a very careful microscopic examination, which revealed no definite structure other than that of normal bone. The patient made a good recovery from the operation, but whether recurrence followed is not known.

DR HENRY R WHARTON had seen two cases of osteitis deformans, one of which, occurring in a man, was under the observation of the late Professor Ashhurst and himself during more than ten years. The second case was in a woman forty years of age. Among the points of interest in these cases is the diagnostic importance of a gradually diminishing stature. This change is largely due to curvature of the bones of the thigh and leg, but changes in the spine also aid. This curvature also involves the bones of the upper extremity, including the clavicle. Another interesting point was the slight impairment of general health in both cases mentioned. The one under observation for ten years showed no failure of his general condition. The other patient was seen only for a short time, but her health was then good. As to treatment, nothing seems to be of avail. The man was for months given potassium iodide without producing any effect.

SUBACUTE INTESTINAL OBSTRUCTION

DR W J HEARN said that many cases were brought to the Jefferson Hospital to be operated on for a supposed obstruction of the bowel which really does not exist. The history of such cases is usually as follows. The patient has probably had an attack of acute indigestion with pain, and, as happens too often in such cases, morphine has been administered to relieve the pain. Then follows the necessity of opening the bowels which the morphine has constipated. Frequent doses of purgatives cause the patient to vomit, enemas are given which only wash out the lower, but do not relieve the upper, bowels, and soon the patient is supposed to have obstruction of the bowel. But certain important symptoms that indicate genuine obstruction are wanting. There is no temperature, the pulse is almost normal, it may be somewhat rapid, but that will be due to the excitement and

apprehension suffered by the patient on finding the bowels cannot be opened. There is but slight distention of the abdomen. There is no muscular tension of the abdominal walls. There are no points of tenderness nor general tenderness over the abdomen. In these cases Dr. Hearn usually recommends a cessation of attempts to evacuate the bowels. He simply permits the patient to rest without any medicine at all, and soon nature rights itself. Many cases of appendicitis or general peritonitis from any cause whatever are mistaken for obstruction, but the lack of abdominal distention and the presence of the usual symptoms of appendicitis and peritonitis reveal the cause of the trouble. Persistent vomiting, great abdominal distention, and inability to pass any gas whatever through the intestines, and, later, great tenderness, a rapid pulse, and a significant facial expression indicate, as a rule, acute obstruction, and if there be fecal vomiting, which is usual, the diagnosis is complete. But in the subacute and chronic obstruction the diagnosis is much more difficult. Then the surgeon confronts a question of great gravity and peril to the patient. In these cases the obstruction is not at first complete and the symptoms develop more slowly. The abdominal distention is later coming on, and the patient is able to pass some gas from the bowels. By the time the symptoms are those of complete obstruction, the patient suffers either from general peritonitis or local gangrene of the intestines, and the prognosis, as is well known, is much more unfavorable than in the acute cases. These facts are demonstrated in four cases now reported, as follows.

Intestinal Obstruction due to an Enterolith in the Small Intestine—A patient of Dr. Kollock, of Newark, Delaware. A woman, aged sixty years, well nourished, abdomen very fat, without previous history of colic of any kind whatever. She was attacked with colicky pains in the lower portion of the abdomen. Up to the time of this attack the bowels had been opened as well as usual as far as she knew. The pains were at first accompanied by vomiting the contents of the stomach and afterwards bile and mucus. Then the vomiting would cease, and two days would elapse before it would occur again. On the seventh day after the first attack she vomited fecal matter for the first time. She was able to pass flatus through the intestinal canal and with some relief to the pain, but no fecal matter. On

the tenth day, when seen by Dr Hearn, she was suffering considerable abdominal pain, but there had been no vomiting at all on that day. There was moderate distention of the abdomen and a more rapid pulse than normal. The area of tenderness on pressure was in the right iliac region. Laparotomy was advised on the basis of the vomiting of faecal matter which had occurred. No other symptoms were present to justify it, with the exception that her bowels had not been opened. An incision was made in the middle line and the parts were explored by the sense of touch. In doing so the hand accidentally came upon a mass in the ileum about eighteen inches from the ileocaecal valve. This mass was delivered through the abdominal incision, and by palpation appeared to be the size of a hen's egg. It apparently filled the entire lumen of the bowel and was immovable. There were areas of gangrene in the peritoneal coat, also areas of gangrene in the mucous membrane of the bowels. As these areas were apparently in a straight line, an incision was made into the bowel through these areas of gangrene about two inches long and the concretion removed. The mucous membrane was closed first and then two rows of Lembert sutures through the peritoneal coat, thus inverting the gangrenous areas. The patient made an uneventful recovery. Nausea all ceased, and the bowels were opened on the second day voluntarily without any laxative. The enterolith has been examined chemically by Dr Stellwagon, who gives the following report: "The concretion had for its base biliary calculus composed of cholesterin and fatty crystals surrounded by triple phosphates." While this stone has for its nucleus a biliary calculus, yet the patient gave no history of ever having had an attack of colic. Of fifty-one cases of intestinal obstruction caused by the impaction of gall-stones, collected by Wissing, thirty-eight died. In some of these cases the calculi were of great size. In the cases reported by Smith and Fagge they measured four and one-half by two and one-half inches in circumference. In all cases enterotomy should be performed at once, and no attempt should be made to crush the enterolith in the lumen of the bowel, as has been suggested by some. The method suggested by Tait of passing a stout steel needle obliquely through the intestinal wall and attacking the calculus in order to break it up, is not worthy of approval.

RICHTER'S HERNIA, LOCAL GANGRENE, PERITONITIS AND
DEATH AFTER OPERATION

Miss P, aged forty-two years, well nourished, of rather large stature, previous health always good Eight days before admission to the Jefferson Hospital she took an overdose of an expectorant mixture for a cold It nauseated her and caused intense straining in the attempt to vomit While straining in the effort to vomit, she suddenly felt a sharp colicky pain over the entire abdomen She then vomited the contents of the stomach On the following day there was no vomiting Nausea was somewhat relieved, but there was no cessation of the pain, nor were her bowels open, notwithstanding she was given very active purgatives On the fourth day the abdomen began to swell, and Dr Hearn saw her then for the first time with Dr Piper, her attending physician Obstruction of the bowel was not then suspected, as the vomiting had apparently ceased The groins were examined for hernia, but none was found, and she insisted she had never suffered from hernia On the evening of the seventh day the vomiting commenced again, and was of a faecal character When Dr Hearn saw her again, the next day, there was every evidence of general peritonitis, constant vomiting, rapid pulse, temperature 101° F, a general tenderness over the entire abdomen, but no defined area of tenderness, with a facial expression that of general peritonitis She was at once transferred to the Jefferson Hospital and operated the same day An incision large enough to permit the entrance of the hand was made below the umbilicus In carrying the hand down the side in the right iliac region, a portion of the intestine was found fixed in the right femoral canal This was carefully detached from the point of adhesion and brought outside the abdomen A portion of the bowel delivered presented the appearance of a large nipple and was gangrenous Some of the contents of the bowel had escaped into the abdomen through the gangrenous tip of this nipple-like projection About half of the lumen of the bowel had been drawn into the ring, and its width on the length of the bowel surface was about one inch and a half, culminating in a point As the larger portion of this nipple was gangrenous it was necessary to perform a resection of the bowel Her condition was alarming, and, as it was necessary to ter-

minate the operation quickly, a Murphy button was used. The abdomen was thoroughly washed out with a salt solution, and closed in the usual manner with a drainage in the lower angle of the wound. During and after the operation her pulse was 140 and her temperature rose to $103\frac{2}{5}^{\circ}$ F. The patient died the following day of general peritonitis.

SUBACUTE OBSTRUCTION CAUSED BY MECKEL'S DIVERTICULUM, OPERATION, DEATH

Mrs S W, aged fifty-six years, for twelve years had suffered from occasional attacks of intestinal colic, accompanied by constipation and followed by diarrhoea, which would last for a week or ten days. On June 20, 1902, she was seized with pain in the abdomen, which was not localized to any particular region, during the following four days she had attacks of pain with intervals of complete freedom, the abdomen would become moderately distended and tender, and again these symptoms would disappear. Purgatives and enemas would bring away some faecal matter and gas, but no free bowel movement was produced. Temperature between 98.6° and 100° F, pulse between 80 and 90. Her family physician, Dr Henry Lovett, of Langhorne, called Dr Hearn to see her on the day after she was taken ill, but owing to his absence from the city his assistant, Dr Roe, saw her on the second and third day, and they both saw her on the fourth day. Unfortunately, about the time of their visits, her symptoms had improved, and, as she was and had been a very delicate woman for many years, and as she had passed through very similar attacks previously, and more especially as her importunities not to operate if we could possibly avoid it were great, a waiting policy seemed justified. During the night of the fifth day her abdomen became distended and vomiting began, which soon became stercoraceous. The following morning the abdomen was opened by an incision through the median line, the intestines were found injected with some serous effusion in the peritoneal cavity. While exploring the posterior abdominal region, there came into view a short obliterated diverticulum, having a short mesentery, coming from the right side of the ileum about twenty inches from the ileocaecal valve and crossing over the free border and adherent to the posterior parie-

tal peritoneum The diverticulum was divided between a distal and proximal ligature which included its mesentery The intestine was then liberated and showed the point of constriction, which, however, did not require any repair Although the symptoms of obstruction were relieved, the patient died four days later of general peritonitis, following the usual course of chronic obstruction

GANGRENOUS RICHTER'S HERNIA RESULTING IN INGUINAL
ABSCCESS, INCISION AND DRAINAGE, SUBSE-
QUENT RESECTION AND ANASTOMOSIS
OF THE ILEUM, RECOVERY

A man, aged sixty-eight years, consulted Dr Hearn, July 26, 1896, for a large phlegmon of the right groin Previous to the present illness he had an attack of enteric fever at the age of twenty-five years, and twelve years before he had an enlarged gland in the right groin, which disappeared under treatment, and very probably was a hernia There was no history of injury or infection of the genitals About four weeks before coming to Dr Hearn he was seized with griping pains in the abdomen, in the meantime he observed an enlargement in the right groin, a week later it took on growth and steadily increased The skin over the enlarged area in the groin was dusky, pain throbbing, tension marked and fluctuation He was admitted to the hospital and prepared for immediate operation Upon incising the abscess it was found to contain about ten ounces of an admixture of pus and bowel contents At the site of the femoral canal there was a small opening which communicated with the bowel The cavity was irrigated and tamponed with iodoform gauze A fæcal fistula remained after the abscess healed, and six months later he re-entered the hospital On the following day Dr W J Roe opened the abdomen, and after freeing the bowel did a resection and end-to-end anastomosis, using Halstead's rubber bobbins Recovery was uninterrupted and uneventful

DR JOHN B ROBERTS referred to two specimens of intestinal calculus that he had placed in the Mutter Museum One of them was passed by a physician after an attack of acute pain in the epigastric region which had not yielded to treatment Surgical advice was contemplated, but before it was obtained

something was felt to give away in the abdomen, and two days later a large calculus, together with a piece of sloughed tissue, was passed from the bowel. The second specimen referred to by Dr Roberts was a calculus, one by three inches in size, which he removed from a woman who had had severe constipation during many years, and secured movements by rectal enemata. The calculus, which was located near the ileocæcal valve, was removed by enterotomy, and the patient soon afterwards died, although there were many reasons to believe that she would recover. This case was interesting because of the history that many years before the patient had suffered from some affection that produced jaundice. At the time of operation the hepatic region was explored, with the result of finding adhesions about the liver, but no trace of the gall-bladder. The nucleus of the calculus, which has never been opened, is believed to be a gall-stone which ulcerated its way into the intestine years before.

DR JOSEPH M SPELLISSY reported that in his service at St Joseph's Hospital, and assisted by Dr Davis, he had removed an enterolith having as its nucleus a common pin. The condition leading to interference existed for months, caused little distress, and consisted of an apparent thickening of the anterior and internal margin of the right iliac bone. While the density of the mass suggested it to be a new growth, its late characteristics pointed to a possible inflammatory origin. Incisions close to the iliac crest passed through an inch thick, apparently fibrous mass, into a small extraperitoneal abscess close to the bone, and containing the spindle-shaped enterolith. A persisting fæcal fistula marred an otherwise uneventful recovery. This fistula was later operated upon during the service of Dr Davis and by him.

DR JOHN H GIBBON said that in the majority of cases of chronic obstruction of the bowels the large intestine was the site of the lesion, and that the cause of the obstruction producing subacute or chronic symptoms was usually a malignant growth. These patients, however, were generally admitted to the hospital for a complete obstruction following previous attacks of subacute obstruction. When operating on such cases where the obstruction is complete and the patient's condition is not good, it is thought to be better surgery to relieve the obstruction by performing colostomy rather than to do an immediate resection.

Littlewood, in a recent article in the *Lancet*, has shown the great advantage to be derived from pursuing the former plan of treatment. Gibbon referred to a case of complete obstruction of the bowel due to a cancer of the sigmoid, in which he did an immediate resection and lost his patient. He believes that this patient might have been saved had he done a left inguinal colotomy and later resected the bowel.

EXCISION OF THE CONDYLE OF THE LOWER JAW FOR BONY ANKYLOSIS OF THE TEMPORO- MAXILLARY JOINT

DR FRANCIS T STEWART presented a girl, aged six years, who twenty-two months ago was attacked by severe pain in the lower jaw and convulsions. The face swelled, pus escaped into the mouth, and five teeth were extracted without relief. Four months later some carious bone was removed from the lower jaw by an external incision. He first saw the child fifteen months ago at the Polyclinic Hospital. She then presented a complete ankylosis of the jaws and two sinuses on the right side, one near the chin and one near the angle of the lower jaw. An incision was made along the body of the jaw connecting these sinuses and a sequestrum the length of the body of the jaw removed. The wound resulting from this operation gradually contracted to a small sinus, but there was no improvement in the ankylosis, it being impossible to move the jaw in any direction. The region of the right temporomaxillary articulation was occupied by a swelling having the consistency of bone. September 28, 1903, the patient was etherized, a scab of collodion placed over the old sinus, and a small vertical incision made over the joint, the parotid gland and the temporofacial fibres being retracted towards the ear. The condyle could not be defined, a mass of bone continuous with the zygoma and glenoid fossa occupying the usual situation of the joint. The neck of the condyle was severed with a chisel, and as much condyle as possible was gouged from the joint cavity. Just at the completion of the operation, a large vessel was severed, and it became necessary to pack the wound. Two days later the wound was sutured except at the lower end, at which point a sinus still persists. Immediately after operation the patient was able to

open her mouth to the normal limit. She now eats solid food with comfort and has a jaw as freely movable as a normal jaw. There is a slight palsy of the orbicularis palpebrarum, which will probably disappear, as the temporofacial fibres were simply stretched and not severed.

DR DE FOREST WILLARD gave a brief history of a case upon which he operated three weeks ago. The patient was a child who two or three years before had fallen while playing and had run a pointed stick into its mouth. The result was the repeated formation of abscesses which opened in a number of places on the cheek and near the ear. After some months a piece of wood was discharged from the temporal region, and healing of the sinuses followed. For two years nothing had been done to restore motion to the jaw, and the incisor teeth could be separated only one-fourth inch. From the history it was believed that interference with motion came principally from cicatricial contraction of the masseter and temporal muscles, and that myotomy of at least the masseter would be necessary. After etherization of the patient, screw power was inserted between the teeth, and the yielding was so marked that cutting of the masseter was dispensed with. By steady pressure the jaws were separated one and three-fourths inches. Now, at the end of three weeks, the mouth can be fully opened and mastication is nearly normal.

RUPTURE OF THE BRANCHES OF THE MIDDLE MENINGEAL ARTERY BY CONTRECOUP

DR STEWART related the history of a man, aged forty-five years, who was struck on the head by a weapon, and admitted to the Polyclinic Hospital in an unconscious condition September 19, 1903. There was a compound depressed fracture of the right parietal bone and a paralysis of the right arm and leg, but not of the face. The pupils were moderately dilated and reacted sluggishly to light. The depressed fragments of the right parietal bone were removed and a piece of gauze packed against a small opening in the longitudinal sinus. The left parietal bone was trephined and a clot of blood measuring about two inches in thickness and about four inches in length was found separating the dura from the skull and compressing the

brain The clot was evacuated and the cavity packed with gauze, the bleeding apparently coming from a number of small vessels The paralysis entirely disappeared by the third day, but the unconsciousness continued for two weeks One week after operation there were a number of severe general convulsions, after reopening the wound on the left side and evacuating a large clot which had reformed, the convulsions ceased The patient is now perfectly well, both mentally and physically

DR G G ROSS mentioned a case in which there was rupture of branches of the middle meningeal instead of the main trunk He packed the area with gauze for three days, and there was no further trouble He operated in three hours after the injury, though there were no symptoms, because of a depressed fracture A clot of considerable size was found

DR JOHN H JOPSON cited a case of meningeal hæmorrhage under his care one year ago in which there was rupture of the middle meningeal artery, but no accompanying fracture He explains the so-called rupture by contrecoup by the fact that adhesions of the dura mater are weak in the region of the middle meningeal artery Tension on the branches of the vessel at the time of injury, especially after a blow, may be great enough to cause rupture Fracture of the skull may not occur, the artery being ruptured by the springing back of the bone This he is inclined to think was the cause in Dr Stewart's case This form of rupture is apt to involve the branches instead of the main trunk of the vessel, and hence might easily account for the hæmorrhage from several places

DR HENRY R WHARTON believes that, in packing to control hæmorrhage from the middle meningeal or the sinuses, the gauze is generally left in for too short a time He has made it a rule to leave the packing in from five to six days or even a week if the wound remains sterile The late removal of the packing is usually not followed by any considerable bleeding, as is the case where it is removed at an earlier period

CONGENITAL DISLOCATION OF THE PATELLÆ BRACHY- DACTYLIA

DR STEWART presented a man, aged thirty-nine years, who came under observation at the Pennsylvania Hospital for fracture

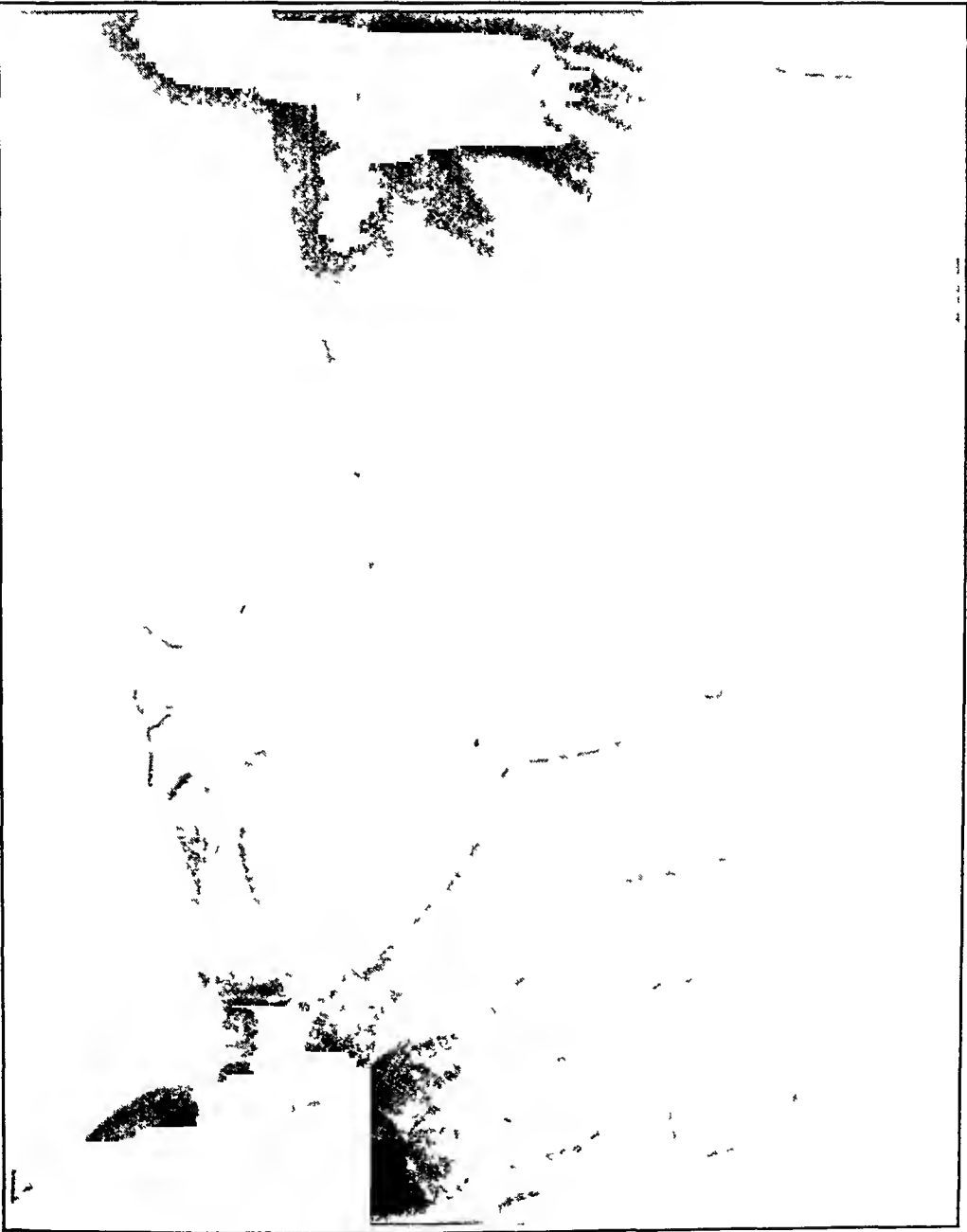


FIG 1—Malformation of hands "Brachydactyly"



FIG. 2.—Malformation of feet ' Brachydactyly' Supernumerary toes

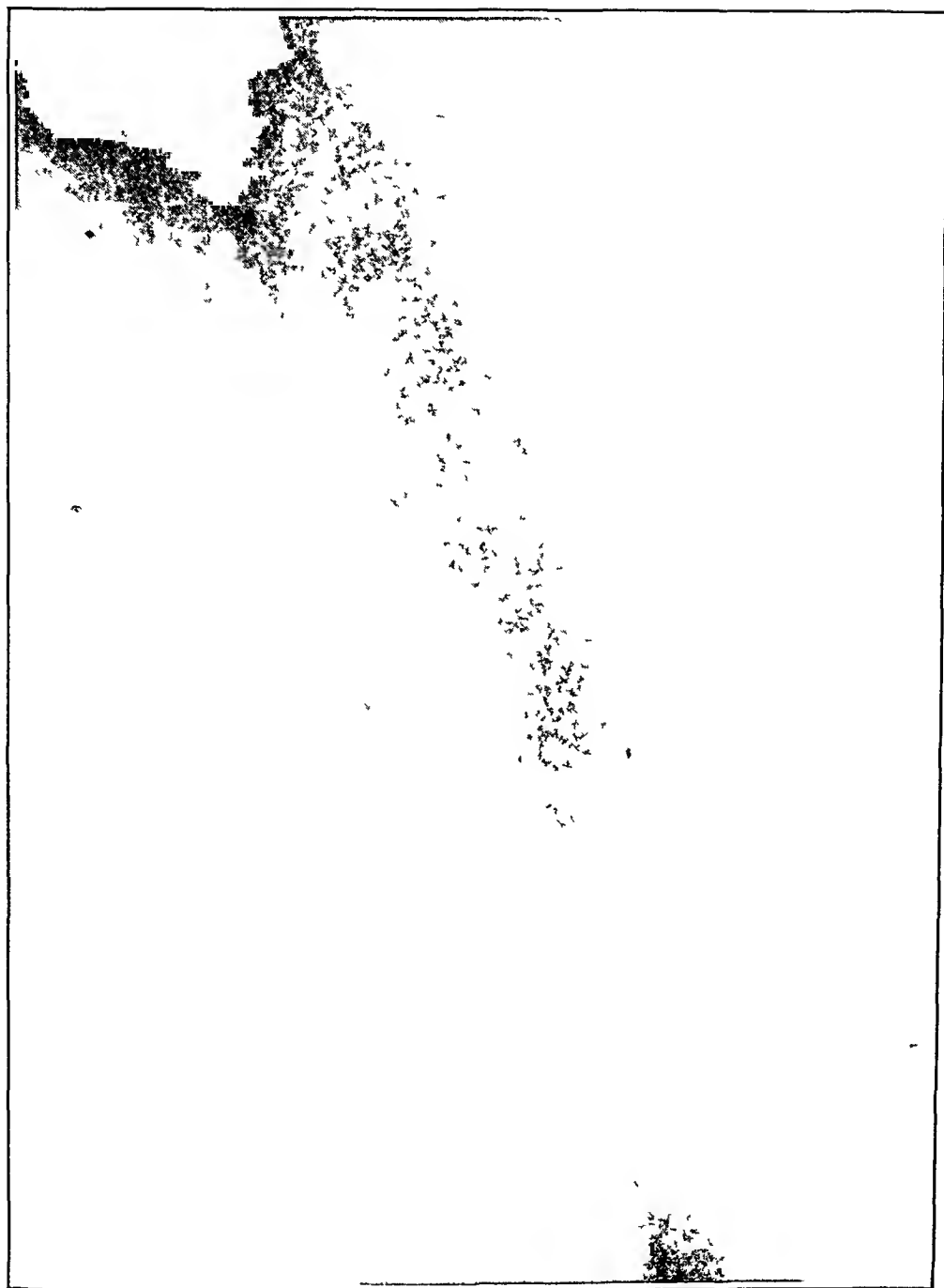


FIG 3 —Congenital dislocation of patella

of the radius His ancestors were German His parents, two sisters, two brothers, and all his relatives are normally formed, excepting one first cousin, who has six toes on one foot He is five feet high, of fair intelligence, is dolicocephalic, has a slight exophthalmos, brows slanting upward in Mongolian fashion, and a high arched palate All the digits of both hands and of both feet are abnormally short, being about two-thirds the normal length All the fingers of both hands except the index and little, which each have two phalanges, have three bones, as shown by the skiagraph By palpation only two bones can be distinguished in each finger Each thumb exhibits three irregularly shaped bones and a sesamoid in place of the phalanges The ring and middle fingers of the left hand are webbed to the end of the proximal phalanx Each foot has six toes, all of which are webbed, and each toe has two phalanges The accessory toe has two large phalanges and a small metatarsal bone which articulates with the internal cuneiform The internal cuneiform bone is larger than normal and projects well below its usual level The middle and external cuneiform bones cannot be seen in the skiagraph, the two middle metatarsal bones apparently articulating with the scaphoid The patient has knock-knees, and when standing the patella rests on the external surface of the external condyle, the internal edge looking forward, the anterior surface facing outward When the leg is flexed the patella passes farther outward and backward until it touches the head of the fibula The skiagraphs were made by Dr Francis Allen, of the Pennsylvania Hospital

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, December 7, 1903

The President, E WYLLYS ANDREWS, M D, in the Chair

KELOID TREATED BY X-RAYS

DR WILLIAM M HARSHA presented a young man, eighteen years of age, who had a small growth behind the right ear for ten years, when it attained the size of an ordinary marble, five years ago, it was excised, the skin was loosened up around it, and primary union was obtained, but in three or four months the tumor was as large as ever. It grew to be twice the size it was formerly. Examination showed the characteristic histological formation of keloid. It was removed three times at intervals of a year or a little more, the last time about two years ago, then it had grown a little larger than it was previously. X-ray treatments were then begun and were given at intervals of two or three days, but were not regularly kept up. He had not had frequent treatments by the X-ray in the last six months. The growth now showed not more than one-sixth of its size when the treatment was begun, it was still getting smaller.

DR A J OCHSNER said that the treatment of keloid by means of the X-ray was worthy of a good deal of attention. In several cases in which this treatment had been used, in which the keloids had been removed, and had gotten worse after removal, the improvement was very marked afterwards by the X-ray treatment. In one of the cases the keloid diminished to a very slight thickening, so that before removing any keloid now one should treat it thoroughly with the X-ray.

PANCREATIC CYST

DR HARSHA reported the history of the following case A man, twenty-nine years of age, developed typhoid fever, beginning October 10, 1901, which lasted ten weeks Before recovery was complete, a tumor appeared above the level of the umbilicus, to the left of the median line When first discovered it was the size of the fist It continued to increase in size and to extend until March 20, 1902, when it completely filled the abdomen except the right inguinal region Fluctuation was plain, the contour smooth and almost symmetrical Abdomen tense with very slight tenderness, temperature reading at 100 at times Constipation obstinate, once or twice formidable obstruction of the bowels was present Most prominent part of swelling on left side a little below the level of the umbilicus Nutrition was impaired, but patient was not emaciated Urine normal except somewhat high specific gravity, 1026 There was no jaundice, glycosuria, or fatty stools April 2, 1902, incision was made and two gallons and a half of fluid evacuated The first fluid to discharge was serous and amber colored, this fluid was about half the total amount The remainder of the discharge looked like pus, was odorless and less than the usual consistence of pus A large tube was inserted surrounded by gauze packing to protect the peritoneum More fluid drained away during the ensuing week, after which the tube was replaced by gauze The wound was kept open for three or four weeks, when it was allowed to close The patient returned to his work apparently well, and soon regained his usual weight

The examination of fluid was negative No tubercle, typhoid, or other bacilli or cocci were found No reaction of pancreatic fluid Examination by Dr F G Harris, then at Cook County Hospital, and pathologist at the College of Physicians and Surgeons Clinic The purulent portion appeared like sterile pus

September 1, 1902, the man came back with a return of the tumor This time it was about the size of a large cocoanut, now filling the half of the left side of the abdomen Fluctuation plain, no temperature, loss of weight or other disturbance Resonance could be made out above and to the left side of the tumor September 9, 1902, incision was made at site of scar from former operation

Cyst wall presented, and was followed upward to find the colon above and over the front of it, extending to the pancreas. One-half gallon of fluid was evacuated. The report of examination by Dr. F. G. Harris is as follows:

The specimen was a thick, turbid fluid of a reddish-brown color, containing thicker grayish-brown mucoid masses, on standing, it deposited a grayish-brown sediment in abundance. Specific gravity, 1030, reaction, alkaline, albumen, present, albumen, 17 per cent. Purdy's method, mucin, absent, blood, present, sugar, absent, urea, trace, steapsin, absent, amylase, absent, trypsin, absent.

Microscopic examination showed a large number of red and white blood-cells, no concretions, no cholesterol crystals.

Gauze packing was done, and cyst drawn up into the opening in abdomen and incised. The cyst wall was one-eighth of an inch thick, and a start was made to detach the cyst wall proper from the peritoneum, but this seemed so formidable that it was thought best to stitch the edge of the opening to the abdominal peritoneum. A large tube was again inserted. This kind of drainage has been continued. The large cavity of the cyst has gradually diminished in size until the present time.

The patient had uninterrupted recovery after each operation, and is apparently in perfect health. He is now working as a guard on the elevated railway. The wound is irrigated from one to three times per week and is dressed every other day. He had used strong iodine and almost pure carbolic acid in the cavity a few times for its more thorough disinfection, to destroy the secreting surface, and for the purpose of promoting its cure, but had seen no marked benefit. The discharge is little more than from any sinus of this size. No unusual irritation of the wound. The location of the tumor and remaining fistula indicate that the cyst came from nearer the tail than the head of the pancreas. The incision was made at this site because the tumor was more prominent here. (Patient presented.)

In the *ANNALS OF SURGERY*, February, 1903, in discussing the etiology of pancreatic cysts, Charles G. Cumston says that very little is known about it. He accepts the classification of Korte:

Retention cysts from obstruction of the excretory duct
Proliferation cysts of the pancreatic tissue

Retention cysts originating from the glandular vesicles and smaller excretory ducts, the result of chronic interstitial pancreatitis

Pseudocysts which arise from inflammatory or traumatic lesions

Robson and Moynihan add congenital cystic disease and hydatid cysts, which latter are also found in other classifications (R and M, page 189, "Diseases of Pancreas") They include under the head of proliferation, cysts, cystadenoma, and cystic epithelioma

The direction of the fistula now points to a part of the pancreas nearer the tail than the head The more common location of these cysts is above the transverse colon

Gussenbauer is credited with the first operation of this kind in 1882, *i e*, incision and drainage The mortality after complete or even partial extirpation has been quite high

In reviewing the subject of operations on pancreatic cysts, Benjamin T Tilton (ANNALS OF SURGERY, July, 1902) quotes Boeckel's report of 115 cases In ninety-nine cases operation concluded in one sitting, incision and drainage, with ninety-two recoveries and seven deaths, while sixteen cases operated in two sittings all recovered Twenty-four cases collected by the same writer of complete or partial extirpation, of this number four died Owing to the deep and postperitoneal situation and its proximity to important structures, it hardly seems justifiable to attempt extirpation Operation at two sittings, if infection is suspected, is of course the one of choice

The fistula in this case has now persisted about fourteen months, and is not due to continued secretion so much as the large cavity and thick walls It has been injected with tincture of iodine and cauterized with 95 per cent carbolic acid to destroy the secreting surface, to disinfect and promote its cure Cases are reported where the fistula remained open several years

In the section of Nothnagel's practice devoted to diseases of the pancreas, Oser says (p 181) he has only found in literature 134 cases of pancreatic cyst He refers to Professor Senn's contribution, and accepts the theory that retention can no longer be considered the chief cause In this series, diagnosis was made only twenty-seven times (in 134 cases) prior to operation The ideal operation, of course, is extirpation, but the high mortality

is a strong argument in favor of simple drainage. If this does not cure, extirpation can be more safely done at a later operation, when the size has so greatly diminished.

DR L. L. McARTHUR said he had presented a case of cyst which began in the head of the pancreas, extended down into the pelvis, and became adherent to the bladder, rectum, and intestines, giving symptoms that first attracted the attention of the patient to his right abdomen. On examination, the speaker found a large fluctuating mass, from which by aspiration was obtained a fluid which converted starch into glucose. He therefore decided that the case was one of pancreatic cyst. Operation was performed and the cyst excised.

In regard to these cysts, the treatment which had given the best results, though not the lowest mortality, had been total ablation of the sac, which may have been impossible in the case reported by Dr Harsha. There was one interesting fact in connection with the ablation of the cyst in the particular case he had, namely, that its origin was so close to the head of the pancreas, that when the stump of the ligated cyst (which was ligated with an elastic ligature) came away there was a biliary pancreatic fluid and fistula, bile regurgitating from the common pancreatic duct up into the wound and out. However, the patient made a prompt recovery. The fistula did not persist long.

DR A. E. HALSTEAD said that he had had an experience with two cases of pancreatic cyst. The first case he saw when he was an interne at the Cook County Hospital. He operated on a case of large pancreatic cyst which occurred in the service of the late Dr Strong. The wall was extremely thin in this case, so that there was no possibility apparently at that time of removing the cyst. The cyst was therefore opened and drained. The patient, a middle-aged man, recovered.

Another case he presented to the Chicago Medical Society not long ago occurred in an elderly woman. The cyst wall was fully one-quarter of an inch thick, and it contained possibly two quarts of fluid. The cyst was dissected away from the peritoneum very easily, and apparently grew from the tail of the pancreas, because when he removed the cyst a piece of the pancreas came with it. He thought probably in the majority of cases these cysts could be enucleated, and if care was taken in separating the cyst wall from the retroperitoneal tissues, particularly

from the large vessels, like the aorta, there was very little trouble. When the whole tumor was removed, the results were much better than where the cyst was drained.

In his case the patient remained in the hospital about four weeks altogether, and when discharged the abdominal wound was entirely healed.

ACTINOMYCOSIS OF JAW

DR HARSHA related a third case, that of a man, fifty years of age, who was referred to him with a probable diagnosis of sarcoma of the jaw. The patient had a swelling of the size of a hen's egg at the angle of the jaw on the right side. He had no temperature, and was in good health in other respects. Family and personal history negative. He had two teeth extracted prior to the beginning of the swelling, which was noted five weeks before the patient consulted the reporter. Whether the extraction of these teeth had anything to do with the swelling he did not know. The swelling increased slowly, was quite hard around the edges, and he thought he could detect a little fluctuation, but was not absolutely sure about this. He suspected actinomycosis, advised operation, which was performed. The tissue was broken down and showed the characteristic appearance of a yellow purulent mass, and around this the tissue was almost as hard as gristle. It was much harder than he expected to find it. There was no connection with the bone or periosteum. The dissection was as thorough as possible, but the wound did not heal kindly. The skin was loosened to make a cover, and as little healthy skin as possible was excised, but the edges became inverted, and at one place underneath broke down, which at a second operation was thoroughly excised. The patient was then subjected to X-ray treatment for a while, shortly after which healing occurred. Iodide of potassium was given for six weeks. The slides showed the characteristic ray fungus, not in the tissue but in the pus.

He had received a letter from the patient within a week stating that he was entirely well.

DR A J OCHSNER said that in actinomycosis he thought the interrupted treatment was the treatment to use, giving large doses of iodide of potassium, say ninety grains, three times a

day, giving that for a week or three or four days, or as long as the patient would stand it, then interrupting it, then repeating the treatment, interrupted for a week at first, then for a month. In one case of actinomycosis in the region of the parotid gland, in which the disease had apparently entirely disappeared, it returned after a few months and caused œdema of the larynx. When the patient returned again he was almost suffocated. Evidently a small portion of the disease had been left at some point at which it could not be reached by the circulation. In these cases iodide of potash could be carried to a certain point, and as soon as absorption took place down to the parasite, the parasite would begin to grow again. This was the way in which veterinary surgeons treated actinomycosis successfully in cattle. Ninety grains was given three times a day, for at least three days or for a week, if the patient could take it, then was interrupted for a week. This was done two or three times, and then it was given for a week each month, for several months, and recurrence of the disease could be prevented in this way.

XANTHOMA INFANTUM

DR LOUIS A. GREENSFELDER reported the case of a boy, aged ten years, from the Jewish Orphan Asylum, who had had no serious illness until two years ago, when he suffered from extensive ringworm of the scalp. This was very obstinate to treatment, but ultimately was cured by the use of the X-ray.

The present affection dated back as far as the patient could remember, but did not cause any concern until the boy sustained an injury of the hand and was brought to him on account of it. No reliable family history could be obtained. The patient had two brothers, who were also inmates of the asylum, but showed no evidences of a similar lesion.

Physical examination of the patient, including a careful examination of the eye, mucous membrane of the pharynx, larynx, nose, and throat, showed absolutely nothing abnormal. Examination of the chest was negative. The liver showed slight enlargement, also the spleen. Blood examination was negative also urinalysis. The only manifestations of the disease were found on the cutaneous surface and the tendons, chiefly the extensor digitorum communis, extensor hallucis longus, and

tendo-Achilles On the anterior aspect of the chest were small pedunculated growths, slightly umbilicated, which sometimes might be confused with beginning xanthoma, but are molluscum contagiosum On the left side was a circular tumor, slightly elevated, soft, velvety, of sulphur color, the centre of which is scar tissue, results of a vaccination The symmetry of the lesion was quite striking A tumor on the right arm was removed The tumor involving the right buttock, also one on left buttock, is characteristic of infantile xanthoma, also characteristic manifestations are in the tendons The one involving the extensor digitorum communis required the removal of one inch of the tendon, and tendon suturing was resorted to There is a tumor of both tendo-Achilles and two on each extensor hallucis longi

The following was the report of the pathologist

The specimen was fixed in Flemming's fluid and stained by safranin The epidermis does not show any changes except a flattening out of the epithelial layers caused by the hypertrophy of the derma The latter is rather cellular The cells are of a fusiform embryonal type, and they are contained in a matrix of fibres These are partly ordinary connective-tissue fibres, partly coarse, yellow elastic fibres The involuntary muscular fibres are also increased, and there are found bundles of them here and there which are not in direct connection with the arrectores pilorum Fat in larger masses is found in the subcutaneous connective tissue Many of the cells of the deeper layers of the derma show very fine fat granules stained blackish-brown by the osmic acid of the fixing fluid

Dr Greensfelder said that xanthoma was a benign connective-tissue new growth, with subsequent partial fatty degeneration These tumors were found chiefly upon the portion of the body exposed to trauma and friction, such as the elbow-joint, knees, etc In this case nine tumors were removed from the anterior surface of the knee, five from the popliteal space, demonstrating the symmetry of the condition

From the clinical and pathological findings, a diagnosis of the infantile form of xanthoma was made This form differed from the xanthoma of adults, inasmuch as the condition was usually congenital or occurred early in life There was no jaundice present The ordinary form of xanthoma was the xanthoma planum, which usually occurred on the eyelids in

adults There was the diabetic form of xanthoma Xanthoma may occur on the mucous membranes of the pharynx, larynx, œsophagus, pericardium, endocardium, and liver In those cases in adults in which there was jaundice, tumors have been found in the liver

DR CARL BECK had seen one case of marked xanthoma of this form, but not quite so extensive He had used electrolysis, and had been able to destroy the tumors entirely by that means He had later used electrolysis in a case of ordinary xanthoma of the eyelids with satisfactory results

DR GREENSFELDER said he did not think electrolysis would accomplish very much in cases other than those of xanthoma planum Judging from the reports of cases, electrolysis had been tried in different cases where counterirritations of all kinds had been a failure The infantile form of the disease differed clinically from the forms of xanthoma planum and xanthoma multiplex of the adult In the infantile form we had a tumor growing not only in the skin, but evidently growing and involving the tendons and the joints Often the tumors extended into the joint cavities themselves

CONSERVATIVE SURGERY IN CRUSHING INJURIES OF THE ARM

DR DANIEL N EISENDRATH reported the case of a boy, aged eighteen years, who, one and a half years ago, was admitted to the Cook County Hospital after having had a girder of a bridge weighing forty-six tons fall on the left arm at the foundry of the American Bridge Company Two men were killed outright in the same accident When seen by him, immediately after admission, the arm seemed so completely crushed as to necessitate amputation at the shoulder-joint The extent of the injury was the following There was a compound comminuted fracture of the left humerus, with extensive laceration of all the muscles on the outer side of the brachial region, and great destruction of skin In addition, there was a complete crushing injury of the forearm of the same side Here the ulna and radius were laid bare, and with the exception of a narrow zone of skin on the radial side there was complete destruction of the skin of the middle one-third of the forearm Examination here showed

laceration of the muscles and tendons on both sides of the forearm, and in addition the ulna and radius were broken in many places in their middle third. The hand simply hung by a narrow pedicle from the forearm.

After thorough disinfection, he removed, with the assistance of the house surgeons, Drs. Cubbins and Lespinasse, all of the loose fragments of the humerus. When this had been done, two inches of the shaft were missing. In order to unite the two ends, it was necessary to drill through the entire thickness of the shaft in the upper fragment. The lower fragment, however, consisted for a distance of two inches of cortex only on the outer side, the inner aspect of the shaft having been removed. A skiagraph taken two weeks ago showed perfect union, the silver wire still being *in situ*. Measured from the acromion process to the external condyle, the left injured humerus was one and a half inches shorter than the opposite. At the time of admission the speaker thought it useless to try and save the forearm after he had finished wiring the humerus and packing and suturing of the wound in the soft parts. He decided, however, on account of the patient's youth, to attempt saving it. The credit for this belonged to the house surgeons, who were greatly interested in the case. He proceeded to wire the ulna and radius after removing the soft parts, which were hopelessly torn, and also many fragments of bone. Following the operation both wires came away spontaneously, having probably cut out. There was extensive sloughing of the soft parts, skin, tendons, and muscles, but the wound finally healed. The examination of the X-ray confirmed the appearance of the arm. There was union of the ulna, but not of the radius, and this caused a permanent pronation position. The patient could use the left arm from the elbow to the shoulder almost as well as the right. From the elbow down there was moderate strength. Patient could flex his fingers and extend his wrist somewhat. Taken altogether, the result was more satisfactory than an amputation at the elbow would have been, with the use of a hook, which such an operation would have necessitated. He proposed to improve the present condition at some future day by wiring the ununited radius. The case was an example of how one could save a member through perfect primary asepsis and the use of conservative methods.

ULCER OF LEG FOLLOWING TRAUMATIC THROMBO-PHLEBITIS OF LOWER EXTREMITY

DR EISENDRATH said that this case was chiefly interesting on account of its probable etiology Sixteen years ago the patient was caught in the falling of a house and his left leg was held down by a heavy rafter for over an hour before he could be released The board fell across his groin The limb from the thigh down began to swell immediately after the injury There was no fracture or laceration of the skin About three months later he noticed an ulcer on the outer aspect of the leg at its middle In the speaker's opinion, there was a thrombosis of either the popliteal or femoral vein wall as the result of the above-described injury, and an ulcer had formed in the same manner as after typhoidal thrombophlebitis The leg was greatly swollen from the knee down, and there was absence of varicose veins and of any of the evidences of syphilis or tuberculosis

SPECIMEN FROM SEVEN MONTHS' ABDOMINAL GESTATION
REMOVED THIRTEEN YEARS LATER

DR JOHN B MURPHY presented a specimen, accompanied with the following history

A woman, forty-one years of age, was admitted to Mercy Hospital, November 18, 1903, on account of an abdominal tumor She gave the following history

Thirteen years ago she had an attack with sudden onset occurring during the night The symptoms were (1) pain, diffused over the abdomen during the entire attack and not more severe on one side than the other, (2) distention of the abdomen, and (3) diffuse tenderness Patient did not know whether she had fever or not There was no nausea or vomiting She was confined to her bed for several weeks Shortly after the onset of the trouble, her physician found what he thought was an abscess in the right tube She was treated medically and by local applications for three months, at the end of which time it was discovered that she was pregnant Operation on the tube was considered, but not performed Abdomen enlarged for six or seven months, and towards the latter part of this time she "felt life" Motions then ceased, and death of the child was diagnosed

Labor did not take place then, or at the end of nine months, and abdomen gradually decreased in size until it reached the normal. Soon after foetal death, a probable diagnosis of extra-uterine pregnancy with rupture was made.

Five years later she had a second attack of "peritonitis," and this time the trouble localized itself in the right iliac fossa, after first being general. A third attack occurred three years ago. A fourth occurred in October, 1902, and followed an induced abortion at two months. A fifth attack occurred last April. Patient was sick for three weeks. In July of this year (1903) she had a very severe attack. Pain was at first general over the abdomen, but after two or three days became localized in the right iliac region. The temperature was 103° F. for two weeks. No vomiting. Abdomen distended; patient in bed five weeks. Menstrual period was delayed three weeks in July; then she began to flow (after onset of attack), and it continued for two weeks. Since then and before that time the periods were regular and painless. Three weeks after this attack she passed considerable pus from the bowel for three days. None since. Six weeks ago she developed a temperature of 106° F. and had several severe chills. Pain and tenderness were localized in right iliac region, and she vomited a number of times. Since six weeks ago a pain has been present in the right lower abdomen quite constantly. She has been confined to bed practically all the time since July, 1903. Bowels were constipated all of the time. For the past four weeks the patient has complained of severe spasmodic pain in meatus urinarius, accompanied occasionally by a desire to pass urine. No pain when urine is passed. Patient urinates every three hours during the day and twice at night. No pain during defecation. Some leucorrhœa.

Previous history. One child living, aged eighteen years. Family history negative.

When patient was admitted to the hospital, there was considerable pus in the urine, but no pus in the stools. Rectal examination was negative. On examining the abdomen a mass was felt to the right of the umbilicus, extending across the umbilical region to the left side. Digital examination showed the presence of a mass close to the anterior abdominal wall just above the promontory, more to the right than to the left side. There was very little abdominal distention, but some tenderness over the

region of the appendix A mass, hard, round, smooth, and immovable, could be felt just above Poupart's ligament on left side It appeared to be adherent to the anterior abdominal wall

During the time she was in the hospital before operation she had considerable pain in the external urinary meatus No temperature at any time

Operation was performed on the 24th of November An incision was made to the left of the median line, through the left rectus muscle As soon as the abdomen was opened, the foetus immediately presented in the wound The wound was retracted widely and the incision enlarged considerably so as to thoroughly expose the parts The foetus was then lifted out of the abdomen The head rested at upper boundary of the right iliac fossa, body extended upward and to the left There were no adhesions of the intestines Adhesions were present between omentum and lower extremities of the foetus to a little above the knees These were organic and the feet were partially absorbed The adhesions were ligated and cut off There was no evidence of a gestation sac except the thin parchment membrane, chiefly comprising the foetus This was so firm as to fold the parts in close compression, thin and firm as a drawn hood, the arms were folded on the chest, the head flexed on the right shoulder, and the chin adherent to the shoulder The fingers were perfectly preserved and mummified No evidence of any connection between the foetus and pelvic organs After the foetus was removed, the incision was extended downward and the pelvic organs examined The tube on the right side was found closed at its fimbriated extremity and bound down, but not distended It was evidently the site of primary gestation The left tube was free Springing from the left ovary was an ordinary dermoid of about the size of a fist This was firmly adherent to the anterior abdominal wall and was inflammatory The patient did not show any evidence of secondary infection, no abscess cavity was found in any place, dermoid did not communicate with intestine, and foetus was not adherent to the intestine at any point The dermoid was removed by loosening it from the adhesions to the anterior abdominal wall and to the bladder, to the left side and enucleated from the ovary, opening in ovary closed with catgut The abdomen was closed without drainage, and the patient recovered

After the foetus and dermoid were removed, the appendix was investigated and found to be very materially thickened, the walls indurated and rigid, and the vessels on the peritoneal surface congested; it extended upward behind the cæcum and was very difficult to detach. The appendix was removed. Dr. Murphy thought possibly the irritation caused by repeated traumas to the appendix by the foetal head might possibly have produced the chronic appendicitis which was present, and the acute attacks described in the history.

They were unable to account for the pus from the bowel, as there was no abscess cavity which could have discharged itself into the intestine, the bladder, or ureters, except it was from the appendix. Since the operation, pus in the urine had been very materially decreased, as was shown by the urinary examinations, but still causes some irritation.

POLYCYSTIC KIDNEY.

DR. ARTHUR DEAN BEVAN showed a large polycystic kidney. Polycystic kidneys were almost always symmetrical. Statistics on this point showed that polycystic kidney occurred on but one side in not more than 2 or 3 per cent. of the cases reported. In the great bulk of cases the condition was bilateral, and the conclusion which had been arrived at by operators was that because they were so frequently bilateral they should be left alone. He thought this conclusion was logical. This case, however, was an exception to the rule. The specimen presented was removed from a man about a year ago. The clinical symptoms were those of pain on the right side in the kidney region. He had considerable hæmorrhage and secondary anæmia from the hæmorrhage.

The usual oblique incision was made and the mass exposed. He could not determine the exact character of the mass until he had lifted the kidney tumor out on to the surface of the loin. Only after this had been done was it recognized as a polycystic kidney, and then he thought it was best to remove it. He ligated the pedicle, removed the mass, and had visions of anuria and death in a short time, because this had been the result in such cases. Much to his surprise, the man made an uninterrupted recovery from the operation, and had regained his health and

weight and strength. He now made plenty of urine of the proper quality, and had returned to work in excellent condition.

HYPERNEPHIOMA

DR BEVAN exhibited a second specimen which was removed from a case of hypernephroma about a month previous. The symptoms were pain, excessive hæmorrhage, and profound secondary anæmia. No tubercle bacilli were found in the urine, no stone was found by the X-ray. A large kidney mass was felt. An exploratory operation was made and a tumor removed, which proved to be histologically hypernephroma. Part of the mass projected into the pelvis like a polypus into the vagina, and was responsible for the very free hæmorrhage which was encountered in the case, with profound secondary anæmia.

At a recent meeting of the Chicago Medical Society, the speaker had made the statement, after saying that he had encountered seven or eight cases of hypernephroma, that in his experience this form of tumor was the most common form of malignant tumor of the kidney. Exception was taken to this statement by one of the discussers. He found, however, that Israel's experience agreed with his own. He had made another statement to which exception was taken, namely, that in his experience they were accompanied by profuse hæmorrhage. The most severe hæmorrhages he had ever seen from the kidney had been in cases of hypernephroma, hæmorrhages where the patient would have profound secondary anæmia, where the bladder would fill up with clotted blood, making it difficult to empty that viscus. He believed that symptoms of any kind did not occur very often unless the hypernephroma had broken through the capsule, and that cases of hypernephroma which came to the surgeon were not, as a rule, of the benign type. They were only infrequently benign. They were the cases in which the hypernephroma had already broken through the capsule and had produced definite symptoms, and these hypernephromas were practically as malignant as sarcoma.

Two weeks after a normal recovery from the operation, the patient had a diarrhoea which could not be checked. One of the internes, Dr Robinson, investigated the case carefully, examined

the fæces, and found in the fæces pieces of tissue which proved to be hypernephromatous tissue.

DR. S. C. PLUMMER reported the case of a man, sixty-eight years of age, who, fourteen months before operation, had a very profuse hæmaturia. He had never had anything of the kind before. The patient states that he passed almost pure blood. This alarmed him somewhat, but as he did not pass blood again he did not pay much attention to the first hæmorrhage, which proved to be the only one. There were practically no symptoms. The patient, about a year later, discovered the tumor himself accidentally one morning before rising from bed, and about that time he was beginning to show symptoms of malnutrition and weakness, but nothing pointing definitely to the kidney. The tumor which he removed was quite a large one, about eight inches long. There was practically nothing left of the normal kidney except a very small portion at one end of the tumor mass. There were three cysts, each of about two ounces in capacity, in connection with it.

PENETRATING WOUNDS OF THE ABDOMEN.

DR. MALCOLM L. HARRIS read a paper with the above title, for which see page 356.

DR. E. J. SENN mentioned some statistics which emphasized the importance of Dr. Harris's paper. These were the statistics of Siegel, taken from the *Beiträge zur Chirurgie*, 1899, and related to intestinal injuries, showing the great importance of operating early in penetrating wounds of the abdomen where the diagnosis had been made and the peritoneal cavity had been opened. For instance, in all cases operated upon within four hours from the time of intestinal injury there was only a mortality of 15.2 in sixteen cases. He thought Dr. Harris's statistics were still better than these. In those cases that were operated upon from five to eight hours from the time of injury, the mortality was 44.4; in those operated upon from nine to twelve hours after the injury there was a mortality of 63 per cent., showing that these were cases operated upon after perforated peritonitis had occurred. After twelve hours the mortality was about 70 per cent.

In subcutaneous injuries of the abdomen, where blunt force was applied, it was a difficult matter, in his opinion, to make a diagnosis and to know when and when not to operate. He referred to the case of a woman who fell to the ground, striking on the buttocks. This happened about six o'clock at night, after she had partaken of a hearty supper. She retired seemingly without any symptoms. At twelve o'clock that night she was taken with violent abdominal pains. He saw the case the following day in consultation. An operation was advised, agreed to, and performed. A perforation was found in the lower portion of the jejunum about the size of a small finger-nail. This case showed how there could be a severe injury without any immediate symptoms, although he thought the mucous membrane in this case might have protruded in such a way as to have closed off the general peritoneal cavity.

In all cases of perforating wounds of the abdomen, he urged prompt operation. If early operation were done, he believed the mortality would be reduced below 10 per cent. in time to come.

DR ARTHUR DEAN BEVAN said that in the matter of the treatment of perforating wound of the abdomen he was rather inclined to the opinion that the whole problem rested upon the question of time,—the time element and the opportunity of doing an aseptic operation. Where it was possible to do an aseptic operation inside of two or three hours, there could be little doubt but that operative treatment should be employed, and he thought the results obtained by Dr Harris in his cases supported that proposition, and furnished surgeons with a strong argument in favor of it. As was shown by the statistics referred to by Dr E J Senn, where the patient was not seen for twelve hours after the injury, it was quite probable that the expectant plan was about as good as the operative method. As a matter of fact, in military experience, the poor fellows who had penetrating wounds of the abdomen were not handled, as a rule, until a considerable period of time had elapsed from the receipt of the injury, a sufficient period in which perforative peritonitis could establish itself. Then, too, in military experience the difficulties of giving patients the benefit of aseptic operations were very great.

He agreed with the conclusions of Dr Harris, but they should be limited, however, to civil practice. He thought we

should have to accept the very careful analyses of the military surgeons of the last two wars, that in military practice, taking all the difficulties into consideration, the expectant plan was the one by force to be selected.

DR. L. L. McARTHUR thought emphasis should be placed upon prompt interference only under such ideal conditions as would obtain in hospital practice, and of which these patients whose cases had been reported received the benefit. In the cases reported there was undoubtedly a perfect surgical technique in the way of antisepsis and asepsis, and which was ideally carried out. Dr. Harris had everything at hand and a corps of assistants that rendered it possible to invade any part of the abdomen boldly, freely, and safely. These conditions, however, did not obtain in many cases, where the patients were seen not infrequently by a surgeon who was not in hospital practice, or where the patient was kept at home through the desires of the family. Under these circumstances he doubted whether any such results could be obtained.

He asked Dr. Harris if he had employed in bullet wounds of the intestine any particular method of closure, or whether he made his closure to fit the case as occasion required; whether he used, for instance, for a simple round perforation, a puckering-string closure, or the double row Czerny-Lembert suture, and whether he did not believe that in certain abdomens which he opened, although there had been perforation, it was perfectly safe to close them completely.

He was not inclined to the belief that every case of perforating wound of the gastro-intestinal tract required drainage simply because there had been a perforation; but that the decision should be made upon the conditions found, through the escape of infective material or not; inflammatory reaction in the peritoneum or not, and the decision then made. Certainly, he thought it should be as safe to close some of these abdomens as to close, for example, the last two typhoid perforations he had had, in which the typhoid stool filled the abdomen, and yet washing it out with salt solution and closing the abdomen, both of the patients had recovered.

Finally, he asked Dr. Harris to give his opinion as to the advisability of surgical interference after, say, the lapse of time

which Professor Senn had stated, that peritonitis always will have gotten well under way in eighteen hours, or whether it would be better to use the expectant treatment?

DR S C PLUMMER narrated two cases which had not been previously reported. Both were operated upon promptly. The first case was one of stab wound about two inches above and to the right of the umbilicus, with a small portion of the omentum protruding through it. The wound was enlarged and through it an exploration was made, but no injury found to any of the viscera. The exposed portion of omentum was ligated off, and the patient made an uneventful recovery.

The second case was one of bullet wound, the bullet having entered in the axillary line just below the margin of the ribs, and could be felt through the skin in the median line just below the xiphoid appendix. An incision was made in the median line, the bullet removed, and an examination showed the wound of exit on the upper convex surface of the liver, and lying loose upon the liver, near the wound of exit, was a piece of cloth from the clothing which had evidently been carried in by the bullet and had passed clear through the liver. In this case the abdomen was full of blood. The wound of exit in the liver was packed with gauze, the wound of entrance in the liver could not be reached through this incision, consequently another incision was made just below the ribs, and the wound of entrance in the liver packed. He was not able to stop the hæmorrhage by this means, and the patient died a few hours later from hæmorrhage.

DR JOHN E OWENS said the practice of the surgeons at St Luke's Hospital, in penetrating wounds of the abdomen, fully bears out the conclusions of Dr Harris's paper. The mortality was greatest among those cases in which operations, for some reason or other, had been delayed, but in cases that were operated on early, before peritonitis set in, the mortality was very much less, some of the cases progressing to a successful termination.

There were some freaky bullets. Every wound of the abdomen is not necessarily a penetrating wound. He is treating a man who had received a bullet wound in the left buttock, but the bullet was removed from the right side over the appendix,

it having burrowed under the aponeurosis of the external oblique. There were no abdominal symptoms.

He mentioned the case of a policeman whom he saw some years ago. The policeman was asleep in his room, and was partially aroused, but sufficiently awake to find that there was someone in the room tugging at his trousers, which were lying on a chair beside the bed. He jumped out of bed and grabbed a burglar. As they got towards the door, the policeman getting a little better of the man, the burglar's accomplice fired and struck the patient in the abdomen. He examined the abdomen, but symptoms were absent except a slight stinging pain. The pulse was not accelerated. He did not examine the back at the time, but in a day or two did so, and there was a bullet wound to the left side of the spinal column. The bullet was discovered under the skin. It had not passed into the cavity.

He recommended a careful dissection, when in doubt, through the abdominal wall until the peritoneum was reached. If a perforation was found, proceed with the operation, otherwise he would let the case alone.

He saw a man a few years ago who had received two bullet wounds in the abdominal wall. He never had a symptom or any intra-abdominal complication. He was quite interested to know how the man received these two bullet wounds, but the information was not forthcoming. There was no operation in this case, as there were no symptoms requiring it. Perhaps to-day one might be tempted to go into the abdominal cavity, if not for one bullet wound, certainly for two. Still, he did not in this case, and yet the patient recovered. This, however, did not weaken the conclusions arrived at by Dr HARRIS.

DR HARRIS, in closing the discussion, said he prefaced his paper with the statement that his remarks would apply entirely to civil practice, as he had not had any experience in military practice, for the purpose of excluding the question of practice in the military service. He thought the subject of the treatment of wounds in military practice was very much confused. Of course, surgeons knew the great disadvantages under which the military surgeon labored,—the difficulty of getting patients early for operation. The secret of success is early operation in these cases.

Hildebrand, who was in South Africa during the war, in an article on the subject, stated that so far as he knew there was not a single case operated under three days. He (Harris) believed, however, that in the future military practice would change materially with the increased facilities regarding portable hospitals, and with drainage surgeons would get better results. The secret of success in these cases would be proper and suitable drainage. He did not think it depended so much on the surroundings of the patient, the hospital operating room, etc., and believed that drainage would largely take the place of them.

As to the kind of suture used, he employed the ordinary suture, not the puckering-string particularly. The wounds were sutured transversely to the axis of the bowel when possible, the first row of sutures taking in all the coats, and this turned in by the usual Lembert suture.

As to drainage, all wounds in which the intestine has been perforated should be drained, not that some of the cases will not recover without drainage, but theoretically, at least, it was impossible to conceive of a bullet penetrating or perforating the intestine without the escape of infective material, consequently every one of these wounds should be considered theoretically an infected wound. He did not know how to differentiate as to which cases would recover without drainage and which would require drainage. It was known that the peritoneum would take care of a great deal of infective material. He had closed some of his cases without drainage, and some had recovered, while others had not. But in the last series of cases he was as convinced as he could be of anything that drainage contributed to the recovery of a number of them. The fact was that every one of these penetrating, perforating wounds of the intestinal tract was theoretically an infected wound. Drainage, therefore, was a very important factor in contributing to the recovery.

As to operating after peritonitis had developed, this was a difficult question to answer. He believed, however, the surgeon would have to exercise his best judgment in the individual case. After peritonitis had set in the chances of recovery were not very good. Personally, however, as a rule, he thought a patient with peritonitis was better if operated on than he was without operation, and, judging from experience in cases of perforative

appendicitis with so-called general or extensive peritonitis, by operating it was found that the percentage of recoveries was constantly increasing. For that reason he would be in favor of operating on these cases even after peritonitis had developed, as a rule, the surgeon exercising his best judgment.

REVIEWS OF BOOKS.

TREATISE ON ORTHOPÆDIC SURGERY By ROYAL WHITMAN, M D, Adjunct Professor of Orthopædic Surgery in the New York Polyclinic Second Edition Philadelphia Lea Brothers & Co, 1903

If one desires to realize the advancement in this department of surgery during the last thirty years, he should compare the two publications from the Ruptured and Crippled Hospital, New York, that were issued in 1884 and 1903, and that fairly represent the work and practice of that institution

The first was "Orthopædia," by James Knight, the founder of the hospital and one of the American pioneers in mechanical surgery This work contains much practical information by which the general surgeon could profit even at the present time While the lack of pathological knowledge concerning tuberculosis led to strange empirical modes of treatment, yet one can see the dawn of therapeutic principles that now are founded on more definite knowledge of cause and effect The mechanical deformities of the body are well described, and their treatment, as distinct from deformities due to disease, is well considered, while the book is a mine of historical information The writer was evidently a reader, a careful observer, and a mechanic

The later work of Whitman differs from the earlier publication of Knight in being scientific from cover to cover It is founded on definite pathological knowledge and a wealth of clinical material carefully observed, accurately recorded, and logically considered All phases of the principal diseases are illustrated by original photographs and X-ray productions in such a successful manner as to add much to the interest and value of the book

While the orthopædic specialist will probably view the work as one of the best treatises on this subject, yet it is from the standpoint of the general surgeon and practitioner who does some surgery that we desire to review it. For these members of our profession far outnumber the orthopædists, and, as their clinical results show only too well, are in need of just the kind of accurate and practical information contained in Whitman's book.

The prevention and cure of deformities following inflammations of joints, traumatic as well as tubercular; the proper protection of injured joints in delicate children after the acute conditions subside; the correct application of braces and methods of extension as applied to fractures involving joints,—these and kindred subjects are much better handled in this work than in the general surgeries that crowd our shelves. In the treatment of delayed union after fractures of the lower extremities by methods of fixation, protection, and extension, we can adapt ideas and appliances in common use by orthopædists with much advantage. Too often we are content to consider our work finished when a sprain, a fracture, or joint injury has passed the acute stage, and do but little to restore the limb to functional use. We are satisfied. The patient is not. The irregular practitioner, with the aid of time, adds much to the patient's comfort and to his own credit. A more intimate knowledge of the range and limitations of manipulation, its indications and its methods, is furnished by such a special work as this.

There are certain chapters in the book that will well repay careful consideration. Some deal largely with matters of diagnosis. The one on non-tubercular affections of the spine, when compared with the portion of the chapter on tubercular spinal disease, will prove very profitable. The same statement can be made, with even greater emphasis, concerning similar sections on joint diseases. A knowledge of the diseases there described will better enable one to make a diagnosis by the correct method of exclusion.

The *symptomatic* treatment of abscesses, as compared with the *expectant* plan of the ultraconservative orthopædist, and the *radical* method of some general surgeons will meet with general approbation. Incisions for mixed infections, or for pressure symptoms, and not as routine practice with the vain hope of curing the underlying bone disease, is the teaching of Whitman.

Excisions in childhood are rightly condemned, except under special and rare indications. The arguments are conclusive, but the lesson is not yet well learned by many of us. A study of the late results of excisions for tuberculosis in childhood is recommended to those who are favorably impressed with the operation.

Special attention is also directed to the correction of deformities in spinal disease by the recumbent treatment upon a hyperextended frame, which is advised in comparison to the forcible correction urged by Calot several years ago, because of the marked tendency to recurrence due to the fact that the gap in the bone is not filled in by new tissue. The wisdom of the correction of the deformity in joint disease by traction in the line of that deformity (as advised by Howard Marsh) is well proven and illustrated. This is also not well appreciated by many practitioners.

As would be expected, there is a fine chapter on congenital dislocation of the hip.

A minor subject treated is that of fracture of the neck of the femur in childhood, a condition not recognized because of the lack of typical signs.

Chapter xx, treating of the foot, is the most original portion of the book. It shows conclusively how the weak and flat foot develops from improper physiological use, the correct understanding of which must determine the logical treatment. It begins with a description of the arches with the changes occurring when the foot is used as a passive support, as active lever, and by the strain of improper postures. Showing that the weak foot is due to the persistence of the passive attitude in place of active

muscular action, he deals fully with the symptoms, diagnosis of early types, and the course of the disability until it reaches a rigid abducted foot or the typical flat foot as recognized by all practitioners.

The treatment is that which has been advised in the articles and discussions during the past years by Dr. Whitman, and which is a recognized advance in therapeutic measures. It seems to the writer that there is no reason why these cases are so seldom diagnosed and so superficially considered by many of us, and why certain illogical plans of treatment are advocated, and he earnestly recommends Dr. Whitman's presentation of the subject.

The remarkable accuracy of the book as a whole becomes evident when it is submitted to the test of actual practice.

WALTER C. WOOD.

NOSE AND THROAT WORK FOR THE GENERAL PRACTITIONER. By GEORGE L. RICHARDS, M.D., Fall River, Mass. New York: International Journal of Surgery Company, 1903.

The book is intended as a working guide for the student and practitioner, and as an introduction to the more complete treatises on the subject. It is the author's aim to teach the practitioner how to diagnose the diseases of the nose and throat, and how to treat them successfully and according to modern methods.

The first six chapters are devoted to the anatomy, physiology, pathology, symptomatology, and methods of examination of the nose and throat in general. The remaining chapters treat of the special diseases. No space is occupied with theory, while the practical points are well brought out.

The entire subject is well covered in an elementary way, and the methods of treatment advised are simple, logical, and trustworthy.

PAUL M. PILCHER.

INTERNATIONAL CLINICS Edited by A O J KLLLY, A M, M D
Vol IV, Thirteenth Series, 1904 Philadelphia J B Lip-
pincott Company

This volume is divided into chapters devoted to treatment, general medicine, surgery, gynæcology and obstetrics, neurology, orthopædics, ophthalmology, and pathology. There are a number of excellent illustrations, and the general character of the volume is the same as the preceding ones.

The chapter on surgery contains an interesting report of a case of interilio-abdominal amputation for sarcoma of the ilium by W W Keen and J C Da Costa. The authors have also compiled a synopsis of the previously recorded cases. Nineteen cases of this operation are reported, with six recoveries. Sixteen of the operations were done for sarcoma and three for tuberculosis.

This volume is also contributed to by Senn, Albarran, Battle, Coomes, Corner, and Dugan. There are papers on vesical calculus, thrombosis of the spermatic veins, cervical lymphadenitis, sarcoma of the submaxillary gland, syndactylitis, traction injury of the perineal nerve, paralysis of the circumflex nerve, rhachitis, acute osteomyelitis of the os calcis, adenomatous goitre, the radical cure of prostatic hypertrophy, and stricture of the œsophagus. One of the best surgical papers is on the differential diagnosis of acute abdominal conditions which require surgical treatment.

J P WARBASSE

LS OF SURGERY

APRIL, 1901

No 4

ORIGINAL MEMOIRS.

TRAUMATIC ASPHYXIA

AND WITH A STUDY OF THE MINUTE PATHOLOGY, AND
SUMMARY OF THE LIT. CASES

BY H. H. A. BEACH, M.D.

OF BOSTON,

Assistant Surgeon to the Massachusetts General Hospital

AND

FARRAR COBB, M.D.,

OF BOSTON,

Surgeon to Out-Patient at the Massachusetts General Hospital

THE writers desire to report the following case, not only because of its great rarity, but because it is the only case in which microscopic study of sections of skin taken from the living has been made, and by this study all doubt as to the minute pathology and cause of the discoloration cleared away. The mechanism of the remarkable condition is expressed by the term traumatic asphyxia or apnoea, the striking discoloration follows forcible compression of the thorax so that breathing cannot take place for several minutes. The number of cases that have recovered, cases which have been studied in life, is very small. It has been possible to find in all literature but

six cases,—one case reported by Burrell and Crandon, of Boston, the other five reported by German observers

The report of the writers' case is as follows

The patient entered the West Surgical Service of the Massachusetts General Hospital on January 2, 1902. He was a large, muscular German, thirty years old, by occupation a grocer, and was said to have been in perfect physical health up to the time of the accident. About an hour before, he had been caught and held by a moving freight elevator. The elevator was stopped and the man released in from three to five minutes. It was related by observers that while being released his face became black and blood ran from his nose and mouth, and that his eyes protruded. He was unconscious for a few minutes after being released.

Examination in the accident room in the hospital, approximately one hour after he was injured, was as follows. Especially well-developed and nourished, perfectly conscious, but dull and sluggish, in a state of moderate shock; temperature 99.5° F. It was apparent from physical signs that he had been subjected to violent trauma from the groins and buttocks to the midthoracic region, over the skin of the abdomen were several contusions, in the left loin and back, low down towards the pelvis, was a large fluctuating hæmatoma, the eighth and ninth ribs on the left side were fractured in the midaxillary line; in the neighborhood of the fractured ribs, for a short distance, was a moderate amount of subcutaneous emphysema. Examination of the heart and lungs was negative. The appearance of the face and eyes was as is shown in the picture. (See chromolithograph.) Pressure on the blue-black skin did not cause it to pale completely as in cyanosis, but, on the contrary, had little effect.

On careful inspection the skin of the face seemed to be dotted with countless spots, from black and reddish-black to blue in color, very close together, while between the spots were lines or areas, very minute, of normal appearing skin. These spots were plainest at the line of the hair on the forehead and close to the normal skin on the neck. The artist has well shown the punctate nature of the coloring. The line of demarcation in the neck in front was sharp, the transverse line running through the inner ends of each clavicle, this can be seen in the picture. What is not shown in the picture, and has not been noted in any other case, is that the



double triangle of the trapezius muscle was marked out very clearly; that is to say, that at the back of the neck there was none of the bluish-black discoloration of the skin except within the confines of this muscle. The ophthalmoscopic examination of the retinae showed no hæmorrhages. (In this connection, it is to be noted that Buriell's case showed retinal hæmorrhages, in Braun's case, however, there were none.) The conjunctivæ bulged forward prominently because of extensive hæmorrhages underneath. The pupils were equal and reacted to light. Urine examination showed nothing abnormal. The patient recovered. At no time was he very sick, except on the third day his temperature rose to 106° F, and he had labored breathing and slight bloody expectoration, and both lungs were full of râles, this condition, however, passed away in twenty-four hours. The hæmatoma in the back was aspirated six times, each time from one to two pints of bloody serum were withdrawn, but this re-accumulated with great rapidity, so that at last free incision and packing with gauze were necessary, after which the condition was relieved, the serum was at all times sterile.

On the second day after entrance, while the discoloration was still in its greatest intensity and had not visibly faded, with the consent of the patient, pieces of skin were removed from the discolored area in the neck for microscopic examination, with a view of throwing some light on the much disputed question of the etiology and minute pathology of this rare condition. So far as we can ascertain, this is the only case in which it has been possible to study sections of the skin obtained from a living patient, and, as will be discussed later in this article, it seems to the writers that the study in this case has definitely settled much of what was previously doubtful as to the pathology.

The discoloration disappeared rapidly after the third day, apparently simply fading out, the areas of normal skin between the punctate color spots became larger and wider, the general color scheme turned from black to lead color, to a slightly cloudy appearance of the skin, and three weeks afterwards the patient's face seemed almost normal, having only a slightly suffused appearance. In contrast to the fading away of the color in the face, the subconjunctival discoloration went through the usual chemotactic changes seen in the absorption of any blood-clot. In the face there were no pigmentary changes, in the eyes these were present. All

the functions of the body were performed normally during convalescence

The gross cause of this unusual clinical picture is admitted to be forcible compression of the chest, extending over some minutes, accompanied by entire cessation of respiration. Knowledge of the pathology has hitherto been obtained from post-mortem findings in fatal cases. It has long been noted that this peculiar discoloration of the face was seen not infrequently in individuals pressed to death in struggling crowds or mobs. Ollivier, Tardieu, and others have reported post-mortem findings in such cases, but, aside from the appearance of the face and eyes, no specially characteristic pathological lesions were found. In all cases it was noted that the blood was black, fluid, and filled all the veins running into the heart, that punctate hæmorrhages occurred into the loose tissues of the scalp, on the surfaces of the pleuræ and pericardium, and the heart and abdominal viscera, that is to say, the usual findings in fatal cases of suffocation from whatever cause.

The minute cause of the discoloration has been the subject of greatest interest, this, as well as the reasons for its sharp limitations, has not been definitely determined. In view of the great rarity of the condition in the living, the writers desire to give a *résumé* of reported cases, together with the important conclusions in the light of their own case.

Summary of Cases—Braun reports one case of his own and gives two other cases, one reported by Hueter, the other by Vogt. Willers, in an inaugural dissertation, discussed these last two cases. It will be remarked in the reports of certain of the following cases that the words hæmorrhages, petechiæ, ecchymoses, extravasations, and effusions are used by those reporting the cases to describe the general cause of the discoloration as well as its punctate appearance. This use of words is manifestly inaccurate in the light of the microscopic finding in the writers' case.

CASE I—Braun, H. (*Ueber ausgedehnte Blutextravasate am Kopfe, Halse, Nacken und linken Arm infolge von Compres-*

sion des Unterleibes) *Deutsch Zeit f Chr*, 1899, Band 11, p 599

February 26, 1878 G K, twenty years old, was crushed by falling masonry, his chest and abdomen being compressed for half an hour. His head and neck were not struck.

Physical Examination—Face no lesion of skin, which was of a dark blue color, especially on the left side The bulb₁ appeared very prominent, in both conjunctivæ, corresponding to the aperture of the lids, there were marked bloody extravasations, and both pupils were dilated and did not react to light There were a great many ecchymoses, from a pin-head to a pea in size, on the face, neck, and left upper forearm Patient did not complain of pain in chest, but of great pain in abdomen, although there were no wounds of the skin or of the internal organs found, nor any symptoms which might point to such He was conscious during the accident and on entrance to the hospital Pulse and temperature normal On the evening of the same day the ecchymoses of the skin were more marked than in the morning, and the pupils were still dilated, but reacted slowly to light Urine was not passed during the day, but was drawn by catheter at night It was clear, acid, no trace of blood, not even on microscopic examination, but there was present a marked trace of albumen

The next day the swelling of the face had gone, but the small punctiform hæmorrhages were still marked The pupils reacted normally Examination of the retina showed no changes nor any extravasation of blood Pulse and temperature normal

Since the patient felt wholly well, and the swelling of the face had gone, and only ecchymoses of the skin and conjunctivæ were present, he was discharged on the fourth day Seen again several months later He was well

(It is to be noted that this case had no severe symptoms, that the compression lasted half an hour, that he was discharged from the hospital while his face was still discolored)

CASE II—Hueter A boy, fourteen years old, was caught by the flail of a threshing-machine over the abdomen He had a penetrating wound in the abdominal wall, from which the intestines protruded, and were put back by Hueter The wound healed without event in four weeks He was not unconscious at the time and there was no injury to the head His face was dark blue in color and covered with petechiæ the size of a pin-head and slightly

larger, with irregular notched edges. This condition was found over the whole face, extending upward to the hair, while the lower boundary ended on a line with the thyroid cartilage. The conjunctivæ contained blood, and also the nasal mucous membrane. There was marked epistaxis. After twenty-four hours the face was no longer blue, but arterial hyperæmia was present, which lasted three days. After this these small blood extravasations ran a normal course, and on discharge only the remains of the subconjunctival hæmorrhage were present.

CASE III—Vogt. In 1871 Vogt was called to see a boy fifteen years old whom he found lying on a soft sandy road, the wheel of a heavily loaded wagon having passed over his abdomen. He was apparently unconscious and was taken to a house. A contusion of the abdominal wall was found, not very severe. The face was blue and contained small extravasations of blood under the skin, as if they were sown seed. The extent of this was the same as in the case of Hueter. There was no injury to the head. All discoloration was gone in three weeks.

CASE IV—Perthes, G. (*Ueber ausgedehnte Bluternavasate am Kopfe infolge von Compression des Thorax*) *Deutsch Zeit f Chn*, 1898-99, Band 1, p. 436.

On July 15, 1898, a boy fourteen years old was working in a cotton mill as a spinner, when, according to eye-witnesses, he was struck by a machine-driven carriage. He was struck on the right side of the chest, and so pressed, with his left shoulder against a bench, that his thorax was crushed into a two hands'-breadth space, but his head remained free. The boy was rescued in an unconscious condition, but while in the factory regained consciousness. He himself said positively that during the first hour after the injury he heard all that happened around him, but could not see. He was unable to recognize his brother, who accompanied him to the hospital.

We found, an hour after the injury, a very small boy for his age, weak and poorly nourished, conscious. The pulse was regular, strong, and 86 per minute. The boy's face was of a blue color, only the lower half of the right cheek being somewhat paler. The dark color did not disappear on pressure, but through it were easily seen countless dark red petechiæ. Similar petechiæ were seen on the upper half of the left side of the neck, and the lids of both eyes were very deeply colored a bluish-red. There was a

slight degree of exophthalmos. The conjunctivæ were completely suffused with blood and the sclera of each eye colored blue-red. No trace of any wound of the head could be found. There was no bleeding from the nose and ears. No paralysis of the nerves of the face and the pupils reacted to light promptly. There was, however, marked swelling of the tissues of the head, which was greater in the temporal regions, and because of which the whole shape of the head seemed changed.

There was a fracture of the left clavicle at the junction of the middle and outer thirds with typical dislocation. Over the third and fourth ribs on the right side of the midaxillary line there were circumscribed tenderness on pressure and crepitation. Breathing was frequent and catchy, but examination of the lungs showed nothing abnormal, especially no hæmothorax. There was no hæmoptysis.

During the course of his illness, the only thing noteworthy was a slight rise in the temperature to 38.3°C without any perceptible cause. From this time on the temperature remained at 37.3°C . The pulse-rate varied from 76 to 96. The absorption of the extravasated blood followed quickly. After four days the dark color of the skin had partly gone, only several petechiæ remaining visible about the eyes, which were still a dark bluish-red.

On discharge, on the 8th of August, the fractures had healed without deformity. The subcutaneous blood extravasations had been absorbed, but the ecchymoses under the subconjunctivæ remained six weeks after the injury.

(Not so extensive, but otherwise similar, with blue extravasations, is the second case reported by Perthes.)

CASE V—A teamster, thirty-six years old, was caught between a part of an overturned wagon and an iron post so that his thorax was compressed anteroposteriorly, his head was not struck, but his left arm was caught underneath the wagon. Immediately he could not get his breath, and felt as if his eyes were starting out of his head. He retained full consciousness, heard clearly words spoken around him, but could not see.

Examination showed a strong man, conscious, but much excited. The pulse was small and rapid, breath very shallow and quickened. He complained of pain in the lower posterior part of the thorax with each inspiration. The whole face had a swollen appearance, especially in the temporal regions, and was of a bluish-

red color This was especially noticeable in the lower eyelids and thereabouts The scleral portions of both eyes were colored red with blood, as were also the palpebral conjunctivæ At the upper part of the neck were several small bluish-red spots Neither in the head nor thorax could any wound be found, not even posteriorly, where the patient complained of pain There was no hæmoptysis In the left forearm there was a fracture of the radius in the middle, complicated with extensive crushing of the skin and muscles on the outside

He was chloroformed, the radius was wired, and the wound drained On the third day there was a rise in temperature to 38.9°C Behind, on the left side of the thorax, where the patient had complained of pain, were found dulness and râles on auscultation There was marked bloody sputum A diagnosis was made of "contusion-pneumonia" The rise in temperature lasted but four days, and on the tenth day following the accident all pneumonic symptoms had gone The bluish-red color of the face had wholly gone in four days, with the exception of that about the eyes On the thirtieth day there were still a few traces of the subconjunctival hæmorrhages There was no disturbance of vision

Perthes discusses his cases as follows, his own use of words is retained The two patients during the first two days appeared to be exactly similar Their faces had a dark-blue coloring, which did not disappear on pressure, but on close observation one could see under this bluish-red coloring still deeper specks caused by the entrance of blood into the skin These petechiæ were also seen to extend to the upper part of the neck The coloring of the face was so striking that the second patient was addressed as "The Nigger" by his companions in the hospital The color in both cases was due not only to ecchymoses, but also to hæmorrhages into the subcutaneous tissue In both cases the eyelids and their immediate neighborhood were the seat of the most marked effusion The peculiar appearance which both our patients had was mainly caused by the deep red color of the scleræ, due to hæmorrhage under the conjunctivæ, no white remaining The patients said that they had immediately lost sight Possibly this was caused

by a venous hyperæmia and œdema of the retina, or perhaps by compression of the optic nerve by retrobulbar effusion of blood. The intracutaneous effusion of blood in the face disappeared very quickly in both cases, on the fifth day only traces of it could be seen. The effusion in the lower lids lasted much longer, and the subconjunctival hæmorrhage lasted from five to six weeks.

CASE VI—Burrell, H. L., and Crandon, L. G. R. (*Boston Medical and Surgical Journal*, January 2, 1902, p. 13.)

"E. F., twenty-two years old, single, was brought to the Boston City Hospital on December 7, 1900, having sustained a crushing injury to the chest. The detailed history is as follows. One hour before admission, the patient, in a standing position, had been caught between an electric car and the door-post at the entrance to the car-house. His chest had been compressed antero-posteriorly, the head and pelvis were not caught. He was held as in a vise fully three minutes before the car was moved, he then fell unconscious.

"Physical examination on the accident table showed a large, muscular man with especially well-developed thorax. He was entirely unconscious, pulse 100, weak but regular, respiration 30, shallow, with a groan at the beginning of each expiration. The hands and nose were cold. There was slight bleeding from both ears and both nostrils, and blood in the mouth; no wounds on the head, pupils small, equal, and did not react, excessive chemosis. Knee-jerks were absent, other reflexes present, but diminished.

"In the region of the left lower ribs anteriorly, about the seventh, eighth, and ninth, near the nipple line, was an undetermined fracture of one or more ribs, undetermined with exactness because of a considerable area of subcutaneous emphysema. This air under the skin extended over the whole left front chest and made palpation and auscultation of this area of little value. There was slight general abdominal spasm, but no unusual dulness, nor was there any vomiting.

"The striking feature of the case, however, was the condition of the man's skin. From the level of the third ribs, upward over the neck and face and into the scalp, the skin presented a

dusky, bluish, mottled appearance This color became only slightly paler if pressed with the finger, and when the pressure was removed it slowly regained its former tint At first it was thought that the patient was cyanotic, but, as the color was not universal over the body, and as it did not disappear on pressing the skin, and as it persisted even after the patient's general condition improved, it was evident that cyanosis was not the cause Examined more closely it could be seen that uniformly distributed all over the dusky skin were minute (5 to 1 millimetre) areas of natural skin-tint, each surrounded by a poorly defined bluish border, these borders uniting in a meshwork This condition extended over the red edge of the lips and on the mucous membrane of the mouth to a slight degree In the eyes there was a considerable subconjunctival hæmorrhage, homogeneously distributed over as much of the sclera as is exposed by the open lids and not extending to the parts covered by the lids There were minute retinal hæmorrhages

" The patient was in a condition of extreme shock, and stimulation to the extent of nitroglycerin $\frac{1}{25}$ gr , atropine $\frac{1}{60}$ gr , and strychnine $\frac{1}{15}$ gr , was given subcutaneously, with ice-cap to head and heaters to body At the end of four hours consciousness returned, and there was considerable improvement in the character of the respiration and pulse About the chest was applied a broken-rib corset, so laced as to limit respiratory movements near the injured part of the chest

" The urine on the day of the injury was dark red, acid, specific gravity 1028, with a large trace of albumen and less blood, and in a few days was normal

" After three days the patient was relatively comfortable, respirations were 30, pulse 80, good volume and tension, sensorium clear, vision slightly blurred The dusky, livid appearance of the skin of the face and neck was unchanged Five days later, eight after the accident, the blue color began to fade, the tint, however, remaining as at first and not going through the usual modifications of a cutaneous hæmorrhage The subconjunctival clot persisted and had not gravitated, as is usual, to the inferior angle of the conjunctiva Eleven days after the injury the unnatural color of the skin was practically gone and the eyes had begun to clear After three weeks the patient got up, and in a few days was discharged practically well "

The dominant and diagnostic feature of these cases has been the blue-black discoloration of the skin, mainly confined to the face and neck above the clavicle, in one the discoloration extended into the forearm for some distance, and in the other it extended over the chest wall to the second or third ribs. The question of special interest is the cause of the discoloration and the reason for its limitation practically to the regions of the face and neck. Is the discoloration caused by hæmorrhages into the subcutaneous tissues, or by venous stasis? Although the writers feel that in the light of their own case there can be no doubt in regard to this, yet, for the sake of completeness and interest, they give briefly the experimental work and the conclusions of the men who reported cases previously.

The work and conclusions of Hueter are reported by Braun (*loc cit*). Hueter experimented on a rabbit. He made marked and continued abdominal pressure, or struck the abdomen a sharp blow. The vessels in the ear dilated and the surface of the brain protruded through a trephine hole, but there was no extravasation of blood. After section of the splanchni in frogs, he obtained dilatation of the vessels under the skin, but no extravasation. Hueter concludes that the discoloration is probably due to stasis of blood from mechanical causes,—1 The sudden upward pressure of blood dilates the vessels of the face, 2 Pressure on the sympathetic nerves of the abdomen and thorax leads to a paralysis of the vessel walls.

Willers concludes that it is not determined whether it is due to stasis or hæmorrhage, but he prefers the mechanical theory of Hueter, that the blood is found only in the face he thinks is due to the lack of valves in the facial veins. He also thinks that these cases are oftener seen in the young, who have more numerous skin capillaries than the old, in whom, besides being less in number, they are less elastic, and in whom such injury most often results in death.

(It is to be remarked that the ages of the cases, including the writers', are as follows: three cases were boys about fifteen years of age, all the others were young adults between twenty-two and thirty-six years old.)

As has been seen in his remarks above, Perthes is of the opinion that the cause of the discoloration is extravasation of blood, either minute or more extensive subcutaneous effusions, or hæmorrhages. He concludes that, following severe contusions with compression of the thorax, marked effusion of blood can occur in the head and its neighboring tissues without there having been any injury to the head itself. This is caused by the transmission of the increased intrathoracic pressure into the veins of the head and neck, its limitation to this area he explains by the absence of functioning valves, there being less competent valves in the jugular veins than in any others on the surface of the body. He states that there are no valves throughout the whole course of the internal jugular and innominate veins except a pair of valves at the entrance of the jugular into the innominate, and that it is well known that these valves are irregular and incapable of resisting the back pressure of an injection mass starting at the vena cava. The same is true of the external jugular. This vein possesses usually two inefficient pairs of valves, the first of which is the most constant and is placed where the vein enters the subclavian. The second pair is midway up the neck (Poulier "Traité d'anatomie humaine"). These valves are no hinderance to the backward transmission of pressure into the veins of the head, and this also explains the limitation of the hæmorrhages to this region, since one can easily inject the veins of the head from the cava, but almost never those of the axillary supply, so we find ecchymoses and effusions of blood only where valves are absent or insufficient. As in these traumatic cases, the same series of events occur in a less marked degree in old people where ecchymoses or epistaxis follow severe coughing. So also in whooping-cough, a transient blindness or amblyopia has been seen.

Burrell and Crandon (*loc cit*) conclude that, while there may be true hæmorrhage into the skin, the facts that the color fades somewhat on pressure, and that the color does not go through the changes of tint usual in an absorbing hæmorrhage, favor the idea that the discoloration is due largely to a stasis of

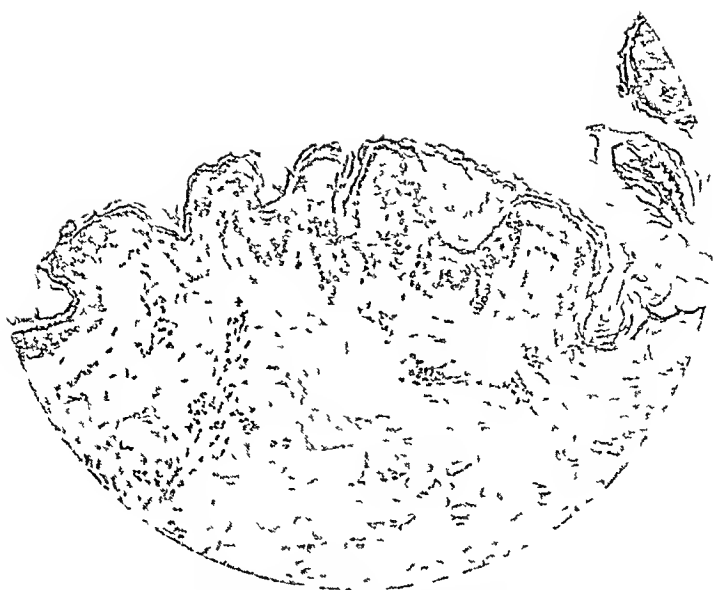


FIG 1 —Vertical section from the surface (low power), showing normal skin with pigment-bearing cells

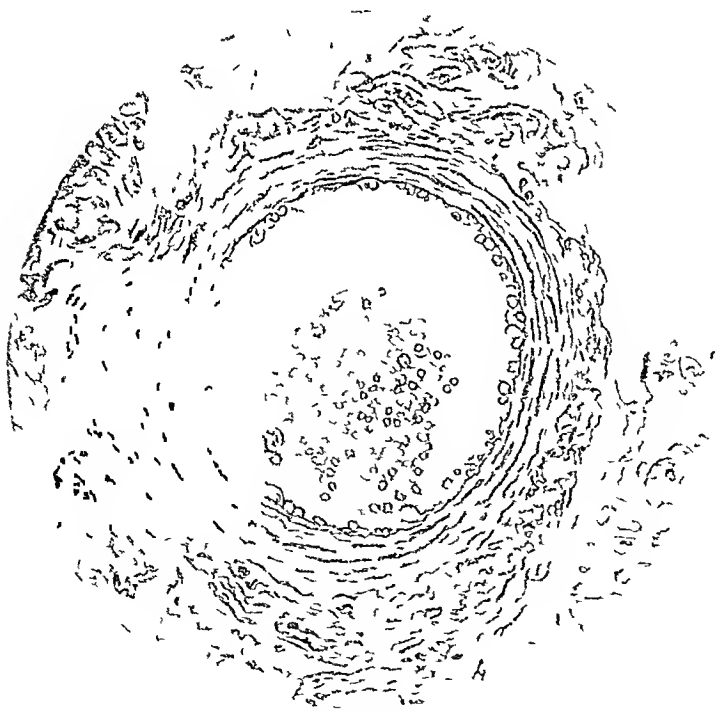


FIG 2 —Section through small blood vessel and neighborhood (high power) It is to be noted that no red blood cells lie outside the lumen of the vessel

carbonized blood in temporarily paralyzed and dilated capillaries

The writers inclined from the first to the belief that there were no hæmorrhages of any size whatever into the skin, and that the discoloration was due to a stasis from mechanical overdistention of the veins and capillaries with or without paralysis from engorgement of or pressure on sympathetic nerves, but to determine this positively excised two pieces of skin from the neck under cocaine anæsthesia from an area as dark in color as any other. These pieces of skin were given to Dr Wright, Pathologist to the Massachusetts General Hospital, and from them numerous microscopic sections were cut and examined. Every section studied showed normal skin, there were no signs of blood in the tissues outside of the blood-vessels. The accompanying cuts (Figs 1 and 2) have been made from drawings of two sections.

It seems to the writers that this microscopic study proves definitely that the theories, that the discoloration is due, to any extent, to hæmorrhages, are wrong.

As to the cause of the sharp limitation of the color to the head and neck, the writers have nothing new to offer, but are inclined to consider rational the theory of Perthes, which ascribes it to the lack of valves in the jugular and facial veins, as outlined above.

The practical conclusions to be drawn from these cases are few in number and should be sufficiently obvious. It is idle to speculate on how many of the fatal cases might have recovered, as the above-mentioned cases did, could artificial respiration have been begun immediately after the release of the individual from the compression. From the very nature of the injury and its attending circumstances, surgical aid can rarely be on the spot except as a coincidence. It is rational to suppose, however, that the immediate use of artificial respiration and oxygen might resuscitate certain of such cases could it be applied at once; the cases that live without such aid will always be extraordinarily rare.

The secondary treatment, aside from combating shock,

must be symptomatic On the second or third day in certain cases pulmonary complications, with pyrexia, bloody expectoration, and labored breathing, may appear, this condition Perthes called a "confusion-pneumonia," it may be expected to subside rapidly and not to result fatally

BIBLIOGRAPHY

- Beek Medical Jurisprudence, seventh edition, London, 1842, p 658
- Braun, H Ueber ausgedehnte Blutextravasate am Kopfe, Halse, Nacken und linken Arm infolge von Compression des Unterleibes Deutsch Zeit f Chir, 1899, Band li, p 599
- Burrell, H L, and Crandon, L R G Boston Medical and Surgical Journal, January 2, 1902, p 13
- Cooper Forensic Medicine, third edition, London, 1865, ii, p 123
- Draper, F W The Post-Mortem Diagnosis of Certain Forms of Asphyxia Boston Medical and Surgical Journal, 1879, pp 561, 579
- Fitz Transactions Massachusetts Medico-Legal Society, 1878, i, p 14
- Heidenhain, A Zum Erstickungstode auf mechanische Weise Urtg-schrift f gerichtl Med Berlin, 1886, xlii, pp 96, 101
- Hueter Casuistische Mittheilungen aus der chirurgischen Klinik der Universität Greifswald Deutsch Zeit f Chir, 1874, Band iv, p 382
- Ollivier Ann d'hyg publ et de med leg, 2d serie, t xviii, p 458
- Perthes, G Ueber ausgedehnte Blutextravasate am Kopfe infolge von Compression des Thorax Deutsch Zeit f Chir, 1898-99, Band i, p 436
- Stone, A Case of Death from Pressure Lancet, 1863, ii, p 187
- Tardieu De la Suffocation Paris, 1878, p 275
- Willers, Gerhard "Ueber die Dilatation der Blutgefasse des Kopfes bei schweren Verletzungen des Unterleibes," 1873 Inaug Dissert, Greifswald
- Witthaus and Becker Medical Jurisprudence, 1894, i, p 785

OPERATION IN SPINAL-CORD INJURIES.

BY SAMUEL J MIXTER, M D ,

OF BOSTON

Surgeon to the Massachusetts General Hospital,

AND

HENRY MELVILLE CHASE, M D ,

OF BOSTON

IN lesions concealed from the surface involving a central nerve organization of extreme delicacy, the extent and precise nature of which are unknown without exploration, the after effects of such far-reaching importance, the parts reasonably accessible, and the possibilities so great of benefiting the patient, the operative stand-point in injuries to the spinal cord is found to be of special interest.

This paper is based upon two cases of spinal-cord injury which Dr Samuel J Mixter permits me to report Both cases were admitted upon Dr Mixter's service at the Massachusetts General Hospital, Case I coming under my care while Surgical House Officer

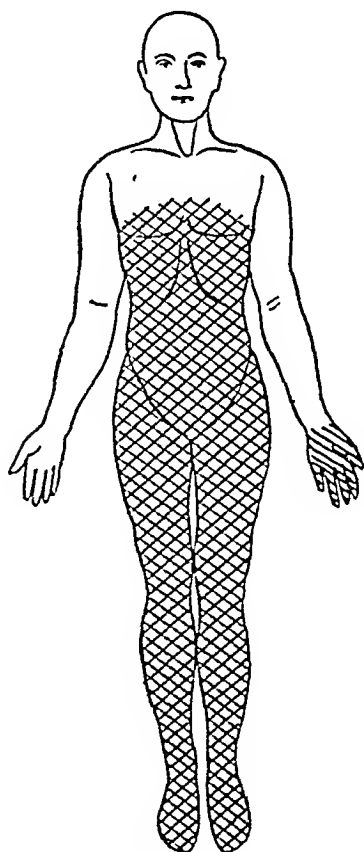
In literature there are numerous valuable articles on injuries of the spinal cord by Thomas,¹ Courtney,² Thorburn,³ Walton,⁴ Kocher,⁵ Bastian,⁶ Lloyd,⁷ Lowenthal,⁸ Taylor,⁹ and others Of recent papers that of Walton emphasizes the value of operation

Case I demands interest and attention for the following reasons 1st, Because there is high fracture of the spine, viz , in the cervical region, 2d, It was operated upon within twenty-four hours, 3d, Unusual length of life following the operation, 4th, Marked improvement in motion and sensation, 5th, Following death there was preserved a complete series of sections of the cord from the pons to the coccyx, making it possible to reproduce sections at different levels showing degeneration, which I have been unable to find in previous literature, 6th, Its bearing upon the question of early operation, and the fact that

if clinical observation suggests total injury of the cord, an operation of little danger in itself, may relieve the pressure and allow the continuation of normal function of uninjured fibres, which would otherwise succumb to pressure and degeneration

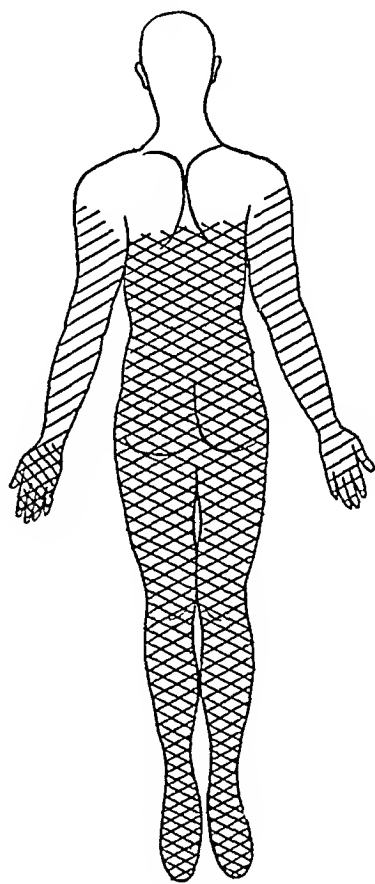
CASE I—On the morning of June 24, 1902, a man forty years of age was brought to the accident room of the Massachusetts

FIG 1



Front

FIG 2



Back

/// = Absence of motion \\\ = Absence of tactile sense

General Hospital with the history of having fallen eight feet from a tree, striking on the back of his neck. The injury occurred at 7 30 P M the previous evening. It was said that he did not lose consciousness.

Upon admission to the hospital he was conscious, pupils reacted to light and with accommodation, he was unable to move

his head. Hearing and sight were normal, throat examination was negative. He complained of headache and pain in the neck. There were no external wounds. There was diaphragmatic breathing, complete loss of tactile sensation, flaccid paralysis below level of fourth rib in front, and below a line from the fourth to the seventh rib in the axillary line (Figs 1 and 2), loss of reflexes. No broken bones were palpable, and no deformity of spine detected. Motions of shoulders slow, arms could be drawn up to chest slowly, but not extended. Unable to put either hand on the opposite shoulder. Type of sixth cervical nerve irritation.

Seen in consultation with Drs. Walton, Baldwin, and Paul, who considered the lesion to be in the region of the fifth and sixth cervical vertebræ.

Operation by Dr. Samuel J. Mixter, Dr. H. M. Chase assisting.

Patient on abdomen, head flexed over the end of the table, incision in median line of neck, spinous processes exposed and laminae and spines of fourth, fifth, and sixth cervical vertebræ found fractured, depressed, and apparently lying against the cord. These were removed, exposing the dura, which looked normal. The dura was opened and cerebrospinal fluid escaped, no blood-clot under dura, small clot found under laminae. Dura not sutured, wick inserted, superficial sutures, and bandage. Good recovery from ether. Temperature gradually rose to 104.6° F, pulse slow and good volume.

June 25, 1902. No change in tactile sensation, arms are moved a little more deliberately.

June 26, 1902. Tactile sensation returning slightly.

June 30, 1902. Tactile sensation recovered over whole body except left hand (Figs 3 and 4). Can locate accurately where one touches him, though sensation is not normal, as shown by the time required to locate the point of contact. Plantar reflexes, knee-jerks, and ankle clonus absent. Slight thoracic breathing. "Soreness" of muscles of arms. Paralysis still complete below dotted line, and of extensors of arms.

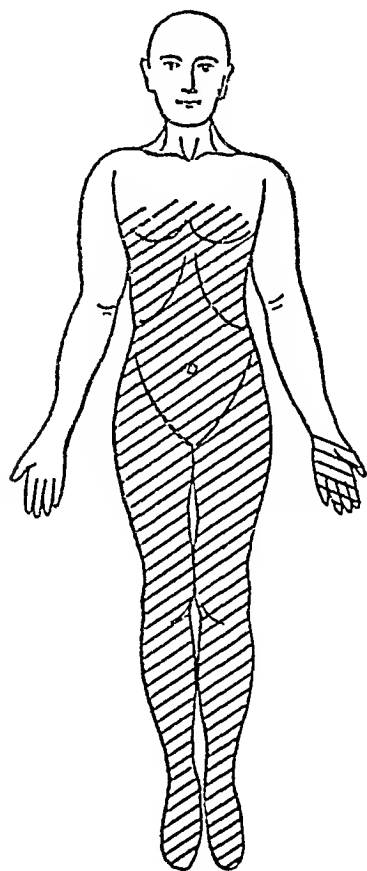
July 6, 1902. Slight plantar reflex and knee-jerk. No cremasteric reflex. Improvement in motion of left arm.

July 15, 1902. Ankle clonus present, tactile sensation normal except in left hand.

July 26, 1902. Hamstring muscles can be contracted, but not

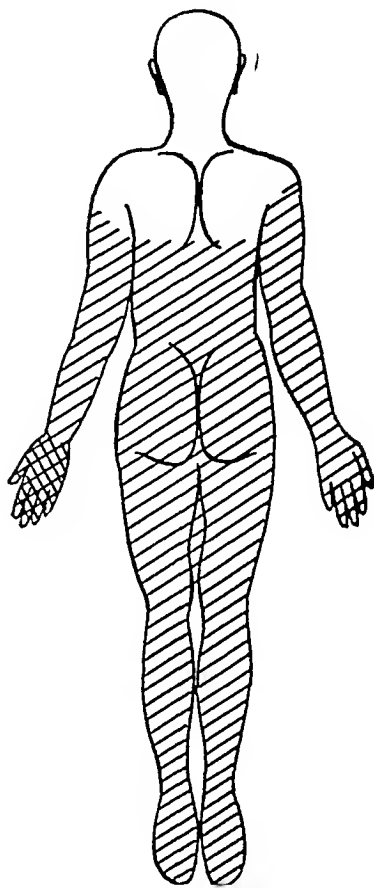
strong enough to raise the leg Right foot can raise the great toe and next two toes Left foot can move the great toe occasionally Active knee-jerks

FIG 3



Front

FIG. 4



Back

////// = Absence of motion

August 4, 1902 Can feebly flex and extend both forearms, slightly flex the fingers of right hand, occasionally raise both knees, and move toes of right foot

August 22, 1902 Tactile sensation preserved throughout, except ulnar side of left hand, front and back No motion in left leg Right thigh and toes move voluntarily Areas of temperature sense, pain sense, and hyperæsthesia as in Figs 5 and 6

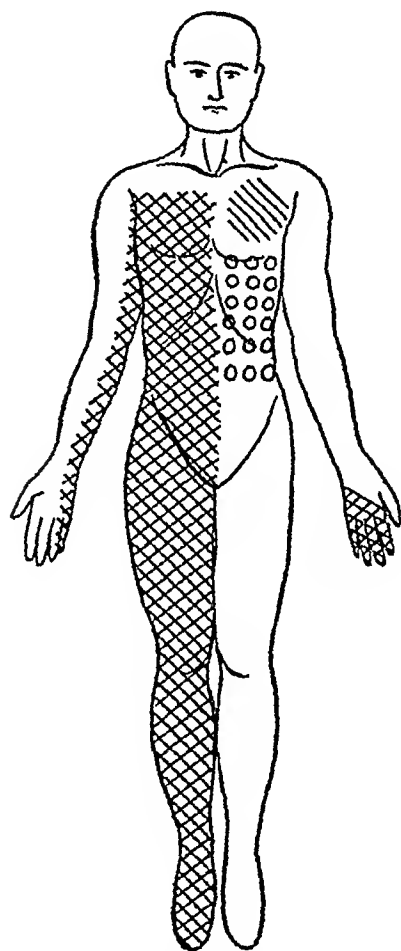
September 10, 1902 Marked atrophy of muscles Abdomen periodically distended, relieved by enemas

September 21, 1902 Considerable pain and twitching in muscles of abdomen, arms, and legs

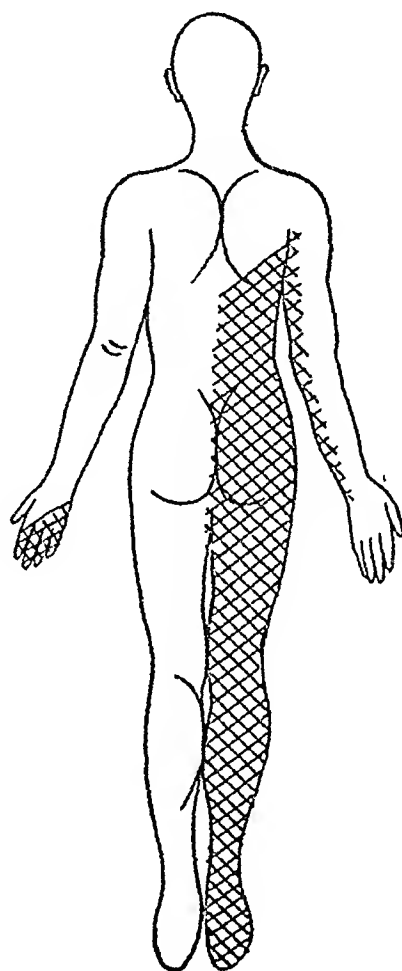
October 1, 1902 Right arm; can use muscles of shoulder, biceps, triceps, extensors of fingers and wrists, and very slight motion in flexion of fingers Left arm considerably weaker than right Can use muscles of shoulder biceps and muscles of forearm.

FIG 5

FIG 6



Front



Back

////// = Temperature sense \\\\\\\ = Pain sense ○○○○ = Hyperæsthesia

October 10, 1902 Right leg; can flex, extend, and adduct right thigh, can flex and extend knee fairly vigorously with weak action of muscles of calf and anterior tibial muscles Left leg, very slight power in muscles of left thigh, no power in muscles of left leg.

October 20, 1902 Gaining slight control of muscles of back, especially on right

November 15, 1902 Now lacks motion in muscles of respiration and abdomen No cystitis and no bed-sores

November 30, 1902 Gaining in every way, can sit up in chair without assistance, can move wheel-chair a little with right hand

Disturbances of sensation mapped out in Figs 5 and 6 on date of August 22, 1902, have nearly disappeared, and areas are blurred and indistinct

December 12, 1902 Occasional gastric disturbance

January 1, 1903 Can pass urine voluntarily, but cannot empty bladder Good control of sphincter ani Flexor muscles gaining faster than extensor muscles Can feed himself with right hand

January 17, 1903 Cannot hold anything in left hand

February 18, 1903 Can use both hands to wheel himself around in chair Urine examination finds color normal, acid, sp gr 1029, albumen slight trace, sugar absent Rare hyaline cast with fatty renal cell adherent, considerable pus, few medium size and small round cells

March 6, 1903 Chill, vomiting, temperature, epigastric pain, distention No abdominal spasm Lungs negative

March 10, 1903 Chills, pain on left side of abdomen Slight tenderness over left kidney No plasmodia White count, 9000

April 1, 1903 Out in chair apparently in good condition, can hold book in both hands for reading Moderate cystitis

May 1, 1903 More improvement on right side than on left, can sit up and raise himself with his arms, but cannot stand

May 14, 1903 Urine examination, pale, clear, alkaline, sp gr 1018, trace of albumen, sugar absent Many triple phosphate crystals, much pus, considerable normal blood, rare caudate cell, several small and medium-sized round cells

May 20, 1903 Chill, fever, pain on left side of abdomen No tenderness over kidneys White count, 14,000 Increased to 20,500 in three days

May 21, 1903 Urine examination, color normal, acid, sp gr 1012, trace of albumen, sugar absent Many hyaline and fine granular casts, few with renal cells and blood-corpuscles adherent, considerable pus

May 25, 1903 Chills more frequent with pain in left side More marked cystitis with renal complication

May 30, 1903 Suddenly became much worse, chills, great weakness and difficulty in breathing Weakened rapidly, and died June 5, 1903

Autopsy—June 6, 1903, by Dr Oscar Richardson

Anatomical diagnosis right nephrolithiasis, occluding stone in the right ureter, pyelonephritis, cystitis, hyperplasia of spleen, small infarct in middle lobe of right lung, dural adhesions in region of upper cervical portion of spinal cord

On opening the spinal canal, the cord presents nothing remarkable until the upper cervical region is reached, where the dura is firmly adherent to the vertebræ and to the cord. Outwardly there are no deformities of the cord. Entire cord placed in hardening fluid

Kidneys combined weight 440 grammes. Capsules strip leaving smooth surface. Pelvis of right kidney dilated, its mucosa grayish-red to black, bathed in semifluid, dirty yellow purulent material. Calices markedly dilated with concretions. Right ureter dilated, occluded by small yellowish stone one and one-half centimetres in greatest diameter. Two pockets containing stones at pelvis of kidney. Left kidney and ureter not remarkable. Bladder contains foul fluid

I wish here to express my appreciation of the courtesies extended me by the Clinico-Pathological Laboratory of the Massachusetts General Hospital, and especially for the interest of Dr Oscar Richardson, who performed the autopsy and removed the brain and spinal cord, placing same in hardening fluid, and later staining and mounting a series of eighty-five cross-sections from the pons to the coccygeal segments, which permitted me to reproduce characteristic sections of each region of the cord to illustrate the tracts of degeneration of nerve-fibres. The sections were stained by the W Ford Robertson's¹⁰ osmic acid method

Cross-sections of the cord at seven levels have been selected,—one through the second lumbar segment, the sixth dorsal or thoracic segment, the eighth cervical segment below the lesion, one through the lesion at the sixth cervical segment, above the lesion at the third cervical segment, one through the oblongata, and through the pons

With transverse lesion at any level of the spinal cord, one expects to find evidence of descending degeneration of motor

tracts below the lesion, of those axones which have been severed from their central cells. With this, also, is a short descending degeneration of some collaterals from sensory fibres. Ascending degeneration occurs above the lesion of such sensory fibres as have been severed from their nerve-cells in the dorsal root ganglia.

The following sections have been carefully compared with those pictured in Bruce's atlas, and the levels accurately established.¹¹

PATHOLOGICAL ANATOMY

Right Half of Cord—Ventral root normal. Direct pyramidal tract shows degeneration of a few scattered fibres. Motor cells in ventral horn more numerous and more pigmented than on opposite side. Crossed pyramidal tract shows marked degeneration, with scattered normal nerve-fibres, which increase in number towards the lateral limiting area. Dorsal root not degenerated on either side. (Fig 7.)

Left Half of Cord—Ventral root shows degeneration with scattered normal nerve-fibres. Direct pyramidal tract slightly more degenerated than on the right side. Motor cells in ventral horn fewer and contain less pigment than on the right side. Crossed pyramidal tract shows larger area of degeneration with fewer scattered normal nerve-fibres.

General—A few scattered fibres of degeneration of direct pyramidal tract are seen in the lumbar segments, but this tract cannot be followed to show degeneration in either sacral or coccygeal segments. No degeneration in dorsal columns (short sensory pathways affected by the lesion stopped at a higher level). Of the pyramidal tracts the greatest degeneration is in the crossed. Cross pyramidal tracts diminish in lower segments. Collaterals, probably representing the reflex arc, are seen going from the dorsal to the ventral horn. These, as would be expected, do not show degeneration.

Right Half of Cord—More marked degeneration of direct pyramidal tracts than on opposite side. Crossed pyramidal tracts show less marked degeneration than on opposite side. Clark's

* I wish to state at this point that by the words left and right half of the cord is meant from the reader's position viewing the diagram.

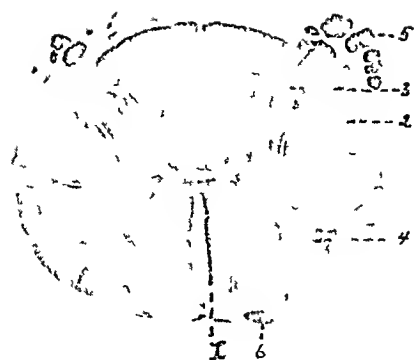


FIG 7—Degeneration of motor (pyramidal) tracts. Second lumbar segment. 1 Direct pyramidal tract. 2 Crossed pyramidal tract. 3 Substantia gelatinosa of dorsal horn. 4 Ventral horn. 5 Dorsal root. 6 Ventral root.

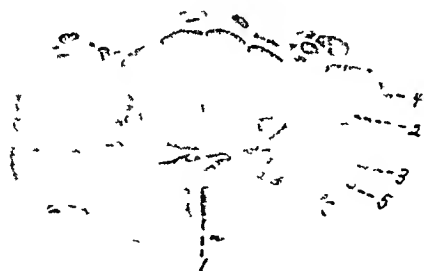


FIG 8—Degeneration of motor (pyramidal) tract. Sixth dorsal segment. 1 Direct pyramidal tract. 2 Crossed pyramidal. 3 Column of Clark. 4 Direct cerebellar tract. 5 Gower's tract.

The photomicrographs were made by Mr. Louis S. Brown at the Pathological Laboratory, Massachusetts General Hospital.



FIG 9—Degeneration of motor (pyramidal) tracts. Eighth cervical segment. 1 Direct pyramidal tract. 2 Crossed pyramidal tract. 3 Comma tract (Schultz's area). 4 Column of Goll. 5 Column of Burdach. 6 Direct cerebellar tract. 7 Gower's tract.



FIG 10—Section through the lesion. Sixth cervical segment. 1 Ventral fissure. 2 Dorsal fissure. 3 Ventral horn. 4 Fibrous tissue. 5 Direct pyramidal tract. 6 Direct cerebellar tract. 7 Crossed pyramidal tract. 8 Gower's tract. 9 Dorsal horn. 10 Column of Burdach. 11 Column of Goll.

column well defined on both sides Direct cerebellar tract more defined on this side (Fig 8)

Left Half of Cord—Marked degeneration of direct pyramidal tracts slightly less than on right side Motor cells show same changes as in previous section Crossed pyramidal tract shows more complete degeneration than on the right side, though there are a few normal fibres

General—No degeneration in dorsal columns, this section is too low for degeneration of descending collaterals of sensory nerves affected by the lesion Areas of all pyramidal tracts increase in higher levels The inner side of Gowers's tract lies against the lateral ground bundle not sharply defined, as there is a considerable admixture of fibres

Right Half of Cord—Motor cells more numerous and more pigmented than on the left side Direct pyramidal tract shows more degeneration than on left. Right dorsal root has small area of degeneration Crossed pyramidal tracts show extensive degeneration Comma tract at base of Burdach's column shows degeneration of short descending collaterals of sensory neurones (Schultz area) (Fig 9)

Left Half of Cord—Crossed pyramidal tract shows most complete degeneration on this side Direct cerebellar tract sharply defined.

General—Distortion of the section probably artificial

Right Half of Cord—Adhesion of large mass of fibrous tissue Great destruction of cord with irregular areas of degeneration and fissures caused by crush The ventral and dorsal horns cannot be distinguished owing to their involvement in the lesion Both motor and sensory tracts are degenerated, but not definitely outlined Greatest degeneration around periphery Dorsal root is degenerated (Fig 10)

Left Half of Cord—No mass of adhesion Ventral horn quite definitely outlined, containing an occasional motor cell and small amount of pigment Areas of degeneration more definitely outlined than on right side

General—This section, contrasted with those immediately above and below, shows the greatest amount of destruction Destruction evidently greatest on right, though scattered normal fibres can be detected

Right Half of Cord—Ventral horns apparently normal, with

small amount of pigment in motor cells Degeneration of Gowers's and direct cerebellar tracts more marked on this side Marked degeneration of the columns of Goll and of Burdach (Fig 11)

Left Half of Cord—Marked degeneration of dorsal columns Degeneration of Gowers's and direct cerebellar tracts

General—On each side the portion of Burdach's column adjacent to the dorsal horn is most perfectly preserved (middle root zone), showing that degeneration of the dorsal root was at a lower level, and that these fibres take a position nearer the dorso-median line as they ascend Motor tracts do not show degeneration above the lesion

In this section only ascending degeneration of sensory tracts is seen The direct cerebellar tract shows more degeneration on left side Gowers's tract, above and a little external to the inferior olivary nucleus and external to the nucleus lateralis, shows as a small area of degeneration (Fig 12)

A number of observers believe that a portion of Gowers's tract continues directly or by relay into the Lemniscus medialis Flechsig follows the tract into the oblongata as far as the region of the nucleus lateralis, where it lies close to the periphery (approximately the level of this section) Lowenthal carried the investigation of its distribution into the cerebellum

The columns of Goll and Burdach cease in the gracile and cuneate nuclei respectively, therefore only those axones are degenerated in this section whose central cells lie at a higher level

I am unable to detect degenerated fibres in this section It is possible that a few fibres of Gowers's tract have ascended to this level and entered the Lemniscus medialis This section is through the superior cerebellar peduncle (Fig 13)

Summary—High fracture of spine, viz, sixth cervical vertebra There were present all the classical symptoms upon which authorities have previously based their opinion that operation was contraindicated because it suggested total transverse lesion with a crush of the cord beyond repair The case was operated upon within twenty-four hours The patient lived eleven and a half months, during which time there was marked and steady improvement, from a condition of total paralysis over an area represented in Figs 1 and 2, the patient regained

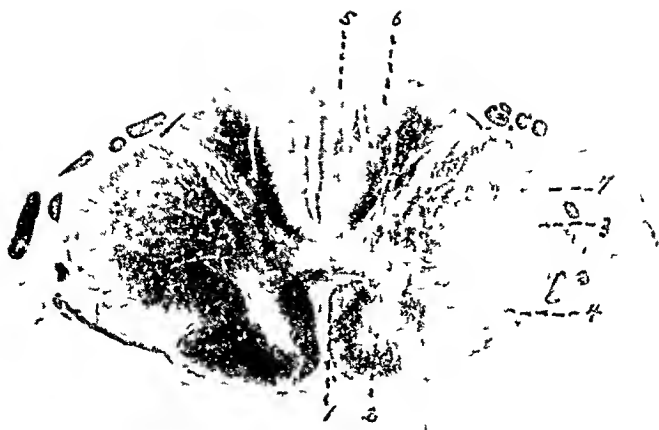


FIG 11 —Degeneration of sensory tracts Third cervical segment 1 Direct pyramidal tract 2 Ventral horn 3 Direct cerebellar tract 4 Gower's tract 5 Column of Goll 6 Column of Burdach 7 Crossed pyramidal tract



FIG 12 —Degeneration of sensory tracts Oblongata 1 Nucleus gracilis 2 Nucleus cuneatus 3 Direct cerebellar tract 4 Gower's tract 5 Nucleus lateralis 6 Inferior olivary nucleus 7 Nucleus arcuatus 8 Ventral pyramids 9 Accessory olive

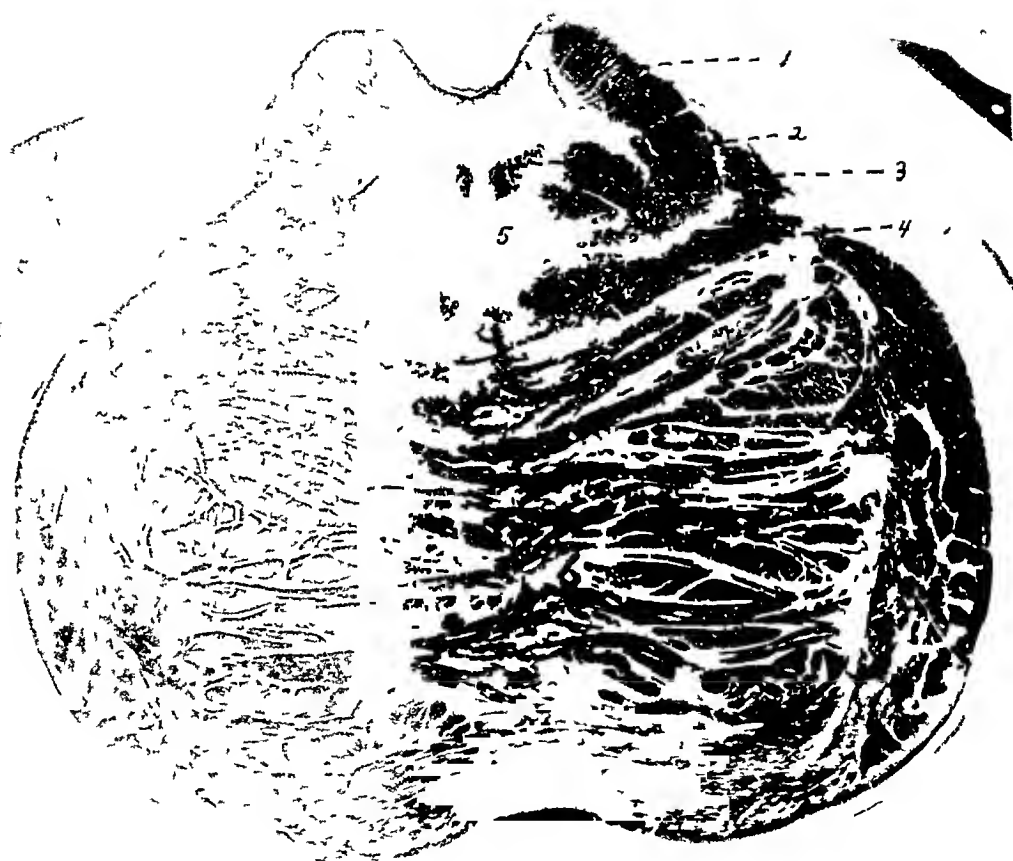


FIG. 13.—Section through superior cerebellar peduncle. 1 Superior peduncles. 2 Posterior longitudinal fasciculus. 3 Tractus lateralis. 4 Lemniscus medialis. 5 Nucleus centralis superior. 6 Transverse and longitudinal fibres of pons.

nearly normal use of his hands and arms, and such improvement in the condition of his body and legs as to lead one to believe that if an unfortunate complication had not arisen, further improvement might have been expected. From a condition of total anæsthesia over the area above referred to, there was practically complete recovery by the ordinary tests.

Following death, a series of cross-sections of the spinal cord from the pons to the coccyx makes it possible to study the paths of degeneration following a crush at an unusual length of time after injury.

Pathological anatomy of the spinal cord shows that descending degeneration of all injured axones occurs in motor tracts below the level of the lesion and of the common tract which is composed of short descending sensory collaterals from injured sensory neurones, it shows the occurrence of ascending degeneration of all sensory axones involved in the lesion.

The sections demonstrate that normal sensory and motor axones exist at the seat of the lesion, though their functions were interrupted at the time of injury, which suggested total destruction of the cord.

The operation showed fracture and depression of the spinous processes and laminae, apparently lying against the cord. There was a blood-clot under the laminae, none under the dura, condition of bodies of vertebrae not known.

CASE II—Mr M, twenty-seven years of age, dived from a raft into shallow water on July 20, 1898, and sustained an injury to his spinal cord. Dr Samuel J Mixter was called in consultation two days later, and advised immediate operation, which he performed. At the time of the operation there was diaphragmatic breathing, complete paralysis of motion and sensation below the level of the lesion, reflexes were absent, apparently a case of total transverse destruction of the cord.

The laminae of the sixth and seventh cervical vertebrae were found fractured and depressed, lying against the spinal cord. These laminae were removed, the dura was opened, and no macroscopic lesion of the cord detected. There were no blood-clots, wound closed, healing without interruption.

The patient was removed to the Massachusetts General Hospital on August 2, 1898, he was seen in consultation with Dr H C Baldwin, and the following conditions recorded. Temperature, 101.4° F, pulse, 96, respiration, 20 Both arms can be slowly flexed, but cannot be extended The left leg can be moved very slightly, the right leg can be flexed about 30 degrees, tactile sensation diminished in both legs, reflexes present, the left patella reflex being increased, there is incontinence of urine and fæces

August 8, 1898 Tactile sensation of right arm normal, except over ring and little finger, tactile sensation of left arm normal The supinator longus muscle of both arms contracts, though no contraction can be felt in either triceps, both hands can be slightly flexed, with very slight extension of fingers Some wasting of interossei muscles, incontinence of urine persists

August 18, 1898 Condition has not changed much, he has a little freer motion of arms and of right leg, no improvement in the left leg

August 23, 1898 Temperature, 103.4° F Phlebitis of left leg and thigh

September 10, 1898 Left ankle clonus present, with slight motion of toes, also slight motion in flexion of left knee.

September 11, 1898 Recovery from phlebitis

October 3, 1898 Left arm, no motion in extension of forearm, no motion of fingers, flexion of wrist and forearm present, fair shoulder movements, pronation of forearm, but no supination Right arm, extension of forearm to right angle, good motion of wrist and forearm, good shoulder movements Left knee and ankle can be slightly flexed, there is contraction of left adductors, causing slight adduction but no abduction, no flexion of left thigh, but slight power of extension

October 27, 1898 Patient lifted his left foot six inches from the bed Right arm can be extended and moved freely Less improvement in motion of left arm with scarcely any power of extension

Discharged from the hospital, October 27, 1898

November 2, 1898 A letter regarding his condition mentions "steady improvement at home, he can move his limbs quite well, can hold things in his hand, and even feed himself a little"

On July 17, 1900, a letter was written by the patient in a plain, legible hand stating that his "right side is much better than

the left side in every way My right leg is as good as ever it was, every muscle as good though not as strong" "Right arm all right, except slight contraction, which is growing less. Right hand fairly good, thumb and forefinger nearly all right in regard to movement, but the sense of touch is not as acute as formerly. The other fingers of right hand not bad, but not quite as good Still quite a contraction in left arm, triceps very weak, and did not seem to be good for anything until six months ago. Left hand not very good, fingers close when the wrist is straightened"

"Left leg, toe-drop still exists, no ankle motion, tendon contracted back of the heel The cords in back of left knee are a little stiff, and are inclined to contract a little, though left leg can be straightened perfectly General health excellent, can walk a half mile without resting, and am getting stronger Took a trip of 200 miles with five changes without difficulty"

On April 3, 1901, the patient was examined by Dr H. C Baldwin, who kindly allows me to use the following notes

"Patient's weight is 135 pounds He now goes about with one cane Deltoid muscles firm and of good strength Slight wasting of left supra- and infraspinati muscles, but their movements are normal Biceps muscles in good condition, and equally strong. The right triceps muscle is strong, the left one is feeble" Right arm can be fully extended, the left arm can be extended to an angle of 145 degrees, representing marked improvement in each Complains of numbness in three ulnar fingers of right hand There is considerable wasting of left forearm and hand, can flex the fingers of left hand moderately, but cannot separate fingers or use extensors of fingers Supinator longus contracts Disassociation symptoms, especially in the hands and over most of left arm Knee-jerks are exaggerated, Babinsky reflexes present, left ankle clonus The left leg is smaller and weaker than the right Toe-drop present Disassociation symptoms over both legs

On December 2, 1903, the following notes were made by Dr Baldwin, who gives permission to use them:

"The patient is engaged in insurance business and weighs 130 pounds His condition has improved in every way, muscles are stronger, and can be used better Can take off his collar and tie and put them on again, which is a distinct improvement

"Tactile sensation in the thumb and forefinger of right hand is still absent

“The shoulders are exceedingly well developed The left triceps is stronger than at last visit, and the arm can be extended to 160 degrees Condition of the legs same as at last visit”

The question is pertinent What is the value of operation in injuries to the spinal cord?

1st It removes depressed fragments of bone apparently lying against the cord, 2d, It removes blood-clots, 3d, Allows the escape of exudate and makes room for inflammatory thickening, 4th, If extensive hæmorrhage is present, either extra- or intradural, it relieves pressure from the cord Cases in literature have shown that degeneration from pressure appears within four days, if a cord is injured by crush and not totally destroyed, the continued pressure of a blood-clot may succeed in completing total destruction 5th, Traumatic spinal œdema may be of such extent as to demand greater space for enlargement of the cord to avoid further destruction of fibres, 6th, There is absolutely no method by which one can early diagnose slight or great pressure of a fragment of bone, the pressure of a small or a large hæmatoma, whether there is a momentary pinch of the cord or constant pressure, 7th, The fact that the cord looked normal in these cases does not preclude the possibility that pressure had existed, nor prove that a condition had existed in which drainage and relief of pressure were not distinctly beneficial, 8th, The patients did not suffer from any ill effect of the operation *per se*, the dangers of operation are very slight compared to the possible benefit to be derived therefrom, and the further satisfaction is obtained that the surgeon *knows* that continued pressure does not exist

I feel justified in concluding, from the history and symptomatology, from the favorable progress, and from the study of the pathological anatomy in Case I, that operation is indicated in such injuries

The statistics of fracture of the spine, contrasting operated and unoperated cases, the percentages of deaths, and average duration of life, have been concisely given in the *Journal of Nervous and Mental Disease*, 1902, Vol xxix, by Dr George L Walton

What observations can be drawn from these cases of unusual duration of life?

The symptoms of both cases were typical of a complete transverse lesion

Kocher regards operation as out of the question in total transverse lesions. There was no sign to even suggest a partial transverse lesion, nor to suggest whether the cord had been momentarily pinched, or was being permanently pressed upon by blood-clot, laminae, or fragments from the body of a vertebra, or by dislocation of vertebrae. All the material at hand was a completely paralyzed body with consciousness, slight motion in flexion of arms, and an unaided diaphragm

Among the exhaustive methods of diagnosis, the X-rays may be invaluable, but too frequently are unsatisfactory

There is one class of cases which has been reported, viz., extreme fracture of the vertebral bodies with extreme displacement, demonstrated by the Rontgen rays, in which it is wiser to resort to rectification and fixation,—the wisdom of this procedure being upheld in the report of a case¹²

What, then, is the problem confronting the surgeon? Should the use of X-rays be unavailing in reaching a decision, the problem, without operation, results in one of speculation. I must use that word in the absence of more absolute information in regard to pressure of clot or bone upon the spinal cord

If we start with the assumption that typical symptoms of a complete transverse lesion are to be accepted as infallible, the surgeon should not operate on such cases as these of which it is the object of this paper to report, but these cases prove as striking examples that typical symptoms of a complete transverse lesion are not infallible, in which case the surgeon is not doing all in his power to relieve the patient's condition unless he operates

A case¹³ is reported where there were classical symptoms of a complete transverse lesion in the region of the upper dorsal vertebrae. The arches of the three upper dorsal vertebrae were found depressed and impacted at operation and removed, followed by steady improvement

How is one to decide whether a cord is crushed beyond repair or not? There are no symptoms which establish, otherwise than by their persistence, irremediable crush of the cord

How long should a surgeon wait? Shock is the principal factor to be considered in this connection. As a rule, operation on most, if not all, of the cases can be delayed a few hours until a greater stability of the nervous system is regained. A certain few cases might impress one with the necessity of immediate operation.

It has been suggested by one operator (Kocher) that one may operate later when long-continued pressure is shown, but having waited that length of time, why is there, then, not a hesitation whether one has to do with pressure of a fragment, or a condition resulting from a momentary crush that has proved irremediable, and likewise stay the hand of the surgeon?

A case¹⁴ is reported in which operation was delayed four days, marked degeneration was found at autopsy the fifth day. Why then delay for other than the constitutional condition—shock? I quote Dr. Walton: "We have no symptoms from which we can assert at the outset that the cord is crushed beyond at least a certain degree of repair, and that early operation in all doubtful cases will not only accomplish all that late operations would do, but also perform it before adhesions and permanent deformity exist by pressure from whatever cause."

Keen¹⁵ is quoted as saying, if immediately after the accident the knee-jerks are absent and remain so, operation is contraindicated.

How long should one wait for this sign? and while waiting, may not pressure do irreparable injury? In Case I, knee-jerks did not return for twelve days, and it has been shown that degeneration may appear within four days after injury.

Case I, from its clinical aspect, was diagnosticated total transverse destruction of the cord at time of injury. Many of the fibres were not destroyed, as proved by the marked improvement in the symptoms, and also by microscopical examination, which a year after injury showed the presence of normal nerve-fibres in the degenerate area.

It seems reasonable, then, to assume that even with the appearance of total destruction we have to do with a condition which for a time has interrupted the registration of sensation and motion on the cerebrum over certain neurones, which after regaining equilibrium will resume their functions

Though fibre degeneration has persisted through the year following the operation, the suggestion seems pertinent that the steady improvement indicates an increased transmission of impulses through the remaining scattered fibres, the analogue of which is found in the increase of functions occurring in the kidney after unilateral nephrectomy, showing the power of nature to accommodate herself to adverse conditions

BIBLIOGRAPHY

- ¹ Thomas, J. J Boston City Hospital Medical and Surgical Reports, 1900
- ² Courtney, J W Boston City Hospital Medical and Surgical Reports, 1898, ninth series
- ³ Thorburn, William Surgery of the Spinal Cord, 1889 Manchester Medical Chronicle, 1892, xvi
- ⁴ Walton, George L Journal of Nervous and Mental Disease, Vol xxix, 1902
- ⁵ Kocher Verletzungen der Wirbelsaule, U S W, xxv
- ⁶ Bastian Medico-Chirurgical Transactions, 1890, lxxiii, p 151
- ⁷ Lloyd Journal of American Medical Association, April 20, 1901, p 1116
- ⁸ Lowenthal, N Rev. Méd de la Suisse rom, Genève, F V, 1885
- ⁹ Taylor, E W Journal of Boston Society of Medical Sciences, December, 1898
- ¹⁰ Robertson, W Ford Pathology of Mental Diseases, 1900, p 20
- ¹¹ Bruce, Alexander Topographical Atlas of the Spinal Cord, 1901
- ¹² Journal of Nervous and Mental Disease, Vol xxix
- ¹³ Ibid
- ¹⁴ Thomas, J J Loc. cit
- ¹⁵ Keen Journal of American Medical Association, 1901

ON THE PRESENT STATUS OF THE OPERATION OF GASTRO-ENTEROSTOMY ¹

BY JOHN ROGERS, JR., M.D.,

OF NEW YORK,

Surgeon to Gouverneur Hospital, Assistant Surgeon to St. Francis's Hospital

THE mortality of gastro-enterostomy has steadily declined from 60 or 70 per cent until now it stands between 15 and 30 per cent, as given in the majority of statistics. This high death-rate for so comparatively simple an operation is somewhat complex in analysis, but two causes, which are to a considerable extent capable of elimination, seem to be visible in nearly all of the bad results, and modifications of the original operation have been and still are being brought forward to correct them. One of these causes has to do with the ever-present but unforeseeable possibility of occlusion of the alimentary tract at or near the point of anastomosis, and the other, which follows the first almost as a corollary, is dependent upon the condition of the patient. Only those who are beyond hope of recovery are, as a rule, deemed ready for so serious an operation. The chance that uncontrollable vomiting may occur in any case operated in the usual way, and lead to a miserable death, is well understood by the medical attendant, and is more or less feared by the surgeon, and many sufferers from entirely relievable distress are allowed to reach such a stage of exhaustion that any interference is rather a means of providing euthanasia than therapeutics. Hence, any method of operating which has given a mortality almost as low in benign cases, as the interval operation for appendicitis, should be carefully considered, for there seems to be such a method, and it is the more worthy of emphasis as, judging from a rather careful study of the literature, it seems to have received little general recognition. If the

¹ Read before the New York Surgical Society, December 9, 1903

medical man or general practitioner is once convinced, as now seems possible, that gastro-enterostomy or, preferably, gastro-duodenostomy has been deprived of most of its earlier terrors, there will follow a great advance in the treatment of many benign though disabling and sometimes dangerous disorders of the stomach

The causes of death as described in their usual order of frequency are shock, collapse, asthenia, or inanition, all practically the same when one bears in mind the extreme debility of the patients usually considered to require so (statistically) serious an interference. The operation too often has been one of last resort. Then come infection and peritonitis with pneumonia a close third. Pneumonia might be classified with asthenia as apt to occur after any abdominal operation upon asthenic subjects, especially after the deep narcotization so frequently necessary to obtain relaxation in epigastric wounds. It has been variously ascribed as due to inhalation of stomach contents,—though with proper care this ought not to happen—to the difficulty of coughing in the presence of an abdominal injury, and to hypostatic congestion. In the majority of instances, however, it seems as unavoidable as the causes of death which stand first in frequency.

Infection, to be sure, should be escaped, and with the improvement in technique of intestinal operations has very much decreased. But here again the asthenia of the subject, usually considered ready to require a gastro-enterostomy, is largely responsible. Absolute asepsis is practically unattainable at present in any form of operation which has to do with the interior of the alimentary tract. The perfectly healthy peritoneum can take care of a great deal of sepsis, but the damaged abdomen of a weakly person is quite another thing. Nevertheless, there is still room for improvement as regards infection.

The fourth most common cause of death, and in some statistics and in the minds of many surgeons it ranks much higher, is obstruction in one form or another. "Vicious circle" vomiting, as it is aptly designated, caused a fatal ending in the second gastro-enterostomy on record, and the numerous meth-

ods brought forward to escape it can justly be regarded as directly or indirectly the underlying cause of much of the other mortality. All but two, or at most three, of the methods which have been employed are "loop" operations,—that is, a loop of jejunum (or ileum) has been united to the front or back of the stomach and carried in front of the colon or behind it through the transverse mesocolon. The vicious circle vomiting when it occurred was then the result of escape of stomach contents into the proximal instead of the distal leg. The distal leg is mechanically occluded by the displacement of its lumen from the opening in the stomach. There may also be a physiological factor in the process, as Chlumski has shown by animal experimentation that filling of the duodenum inhibits the peristalsis of the stomach. The attempts to avoid this accident by giving the loop some particular position in relation to its mesentery, or its legs, or the stomach, or the colon, or by making an entero-anastomosis, led to too prolonged operations, with their numerous dangers and the consequent use of mechanical appliances to save time,—and to many infections, and to intestinal obstruction by volvulus of the loop or by hernia and strangulation over it of the gut lower down. But experience with the loop operations demonstrated the necessity of making the fistula as near the greater curvature of the stomach as possible, and also the value of entero-anastomosis as the base of the legs of the loop. Aside from the risks of a long operation and the maximum danger of infection by opening the alimentary tract in three places, there need then (after entero-anastomosis) be no reasonable expectation of "vicious" vomiting. If it occurs, it is an unavoidable accident inherent in all the loop operations.

Another result of these experiences has been the survival of the Murphy button against all mechanical competitors. One surgeon of very large experience, who always uses the loop, told me that before he employed this contrivance he often had serious vomiting, sometimes followed by death, but since he began to employ the button, in some fifty or sixty cases, he has had none of this trouble. In general, this seems to agree with other reports. The accidents usual with the button have some-

times happened, but dangerous or fatal vomiting is at least rare, apparently because the button, by nearly filling the lumen of the gut, is a hindrance to sharp kinking or spur formation. Of the other methods not involving any loop, the first to be mentioned is gastro-duodenostomy. The union of the stomach with the descending duodenum, introduced by Billroth for restoring continuity after pylorotomy and improved by Kochei, had been utilized in certain cases of benign stenosis by Henle and then by Villard, but lately has been advanced by Finney as a substitute for all gastrojejunostomies. In the Finney operation its prototype, the old Heinecke-Mikulicz plan of pyloroplasty, is amplified by transposing the transverse anterior division of the pylorus into a horseshoe-shaped Ω incision, six to ten inches long, through the under part of the pylorus and adjoining greater curvature of the stomach and descending portion of the duodenum. The opening is thus large, in the lower part of the stomach, and provides free drainage. It is anatomically and physiologically correct, and, when circumstances permit, the few written reports and the many verbal ones I have heard seem to favor it without qualification. But gastrojejunostomy is undoubtedly a necessity for the greater number of cases.

Roux's method "en Y" attempts to solve the difficulty of the loop by section of the gut at the summit with implantation of the distal end into the stomach, and of the proximal end into the intestine below, but the numerous unpleasant possibilities, the chief of which are the time it requires and the increased risk of infection, have not made it popular. The other operation, which does not involve the use of any loop, is the one to which I wish to call attention. It is that described by Petersen as used in Czerny's clinic. He reports 215 gastrojejunostomies with only a 5 per cent mortality from all causes in benign cases, and among these there was not a single instance of serious vomiting and no obstruction. It is based on the simple anatomical principle that the first few inches of the jejunum lie directly in contact with the posterior surface of the stomach, separated from it only by the non-vascular portion of the mesocolon, and

that this part of the jejunum descends vertically and without any turns. To perform the operation, after opening the abdomen by a median four-inch incision just above the umbilicus, the position of the greater curvature is noted. The transverse colon and omentum are turned up on the thorax, and the posterior surface of the stomach is exposed by tearing through a portion of the mesocolon, which is free from vessels. An area about two inches square is thus exposed, and attached at its margin by four Lembert stitches to the edges of the rent. The plica duodenojejunalis is then felt for and seen, and, while the gut is held up perpendicularly to the spine, it is attached from two to four inches below its origin, by a row of Lembert sutures placed transversely to the long axis of the gut around one-half the circumference of its free border to the opposite exposed posterior stomach wall. The ends of the first and last stitches are left long as guides. In front of this the stomach and gut are opened, and the cut edges sutured or a Murphy button is inserted. The long guide and end stitches behind are then used as starting-points for another row of Lembert stitches to close off the fistula. The omentum and transverse colon are replaced and the abdomen closed. The jejunum is thus anastomosed in its normal position, and without any twists, to the adjoining posterior stomach wall. There is no loop to become occluded, and no chance for volvulus or hernia above it. In Czerny's clinic the Murphy button, supplemented by a ring of Lembert sutures outside, has generally been employed. Mikulicz (after Socin) advises an opening on the free border of the gut, transverse to its long axis and suture only. But the button is quicker and, if properly reinforced by suture externally, leaves little to be desired. Liquid nourishment can be administered as soon as the effects of the ether have passed off. Retention of the button in the stomach, in spite of the numerous instances of its harmlessness (in one case it was retained nearly seven years) may be avoided by the use of Hildebrand's or Weir's modification of the instrument. But there is no absolute guarantee that even this will not fail, as I know of one

case¹ in which such a button (apparently inserted by Dr Weir himself) was retained in the stomach, and gave rise to symptoms enough to require another operation for its removal. And in this connection it is worthy of note that a retained button is reported as the cause of death in at least one patient from hæmatemesis. The autopsy showed the button embedded in an ulcer of the stomach with an open vessel under it.

A line of sutures externally to reinforce the button has also proved fatal by too much narrowing of the lumen of the gut, but this is perfectly avoidable, and such an error should not count too much against the additional security, although reinforcing sutures evidently favor retention of the button in the stomach by narrowing the lumen of the gut through which it must pass to escape properly. The following cases, which were operated upon at the St. Francis Hospital, serve well to illustrate this Czerny-Petersen method.

CASE I—M. H., thirty-two years old, laborer, has had dyspepsia for the past two years, which during the last six months has grown much worse. Lately there has been vomiting. Pain in the abdomen is constant, especially after taking food. There has been a very marked loss of flesh and strength, and also a troublesome cough with some dyspnoea on exertion.

Physical examination revealed consolidation of the left apex and many tubercle bacilli in the sputum, with a tumor in the epigastrium about the size of an orange. As the patient was in such distress from the pain and vomiting, operation was performed on July 27, 1903. A median three-inch incision just above the umbilicus revealed a pyloric tumor and a much dilated stomach. The tumor had all the gross appearance of carcinoma. There were no adhesions, and, with the exception of a few enlarged lymph nodes in the immediate neighborhood, there were no metastases. This was an excellent case for removal, but the general condition forbade any more than the briefest interference. A retrocolic posterior gastrojejunostomy was therefore accomplished, with the aid of a Murphy button reinforced by suture, within three inches of the beginning of the jejunum. After stitching the exposed

* Personal communication from Dr J. A. Blake.

posterior stomach wall to the edges of the opening made in the mesocolon, the jejunum was drawn taut, so that the portion between the plica duodenojejunalis and that in the grasp of the assistant's fingers formed a straight line perpendicular to the spine. The point selected for the fistula was one slightly above that where, in the position of the parts noted in first opening the abdomen, the greater curvature crossed the beginning of the jejunum. Thus the latter, when the stomach and intestine were replaced, descended vertically downward from the plica to its first turn below the fistula.

Recovery was uneventful. There was no vomiting and no pain, and liquid feeding was begun that night, owing to the extreme asthenia. The patient was out of bed at the end of two weeks, and left the hospital shortly afterwards without having passed the button. No change was noted in the tumor, which seems to confirm the belief in its malignancy.

I have since heard that death followed at home sometime in November from phthisis, without the return of vomiting or abdominal pain. The relief of vomiting was expected, but the disappearance of the pain impressed me greatly. The operation would offer a reasonable hope of relieving much of the suffering of gastric carcinoma, even when unaccompanied by pyloric obstruction.

CASE II —A D, fifty years old, female servant, was received in the medical service with a history of pain in the region of the stomach, increased after taking food, and of vomiting. Of late the vomiting had become more frequent, and there had been some loss of flesh. Physical examination revealed a rather feeble and prematurely old-looking woman, with marked epigastric tenderness on pressure just to the left of the median line. No tumor was perceptible. After three weeks of medical treatment without improvement, and with a diagnosis of gastric ulcer, operation was performed on August 18. A median four-inch incision, having the last inch below the umbilicus, revealed a somewhat dilated and thin-walled stomach. No other gross abnormality was noted. A retrocolica posterior anastomosis was carried out as before with the Murphy button. The fistula was placed about three and one-half inches below the plica duodenojejunalis. Liquid feeding was

begun the following day. There was no vomiting and no complaint of pain, and the patient seemed well on the way to recovery, but about a week later a bad cystitis developed from catheterization. This was followed by uræmia, and death on August 31. Autopsy demonstrated that the anastomosis was perfect, though the button had fallen into the stomach. The latter showed a chronically inflamed mucosa, and had become more or less contracted and funnel shaped, with the fistula at the apex of the cone. No ulcer nor its cicatrix was discovered. The cause of death was a suppurative cystitis and pyelonephritis. The other organs were normal.

This was a case of bad chronic gastritis with dilatation, and the constant distress with the loss of flesh and strength and the inability to work seemed to justify interference. Medical treatment had failed to give any relief to the symptoms, but after the gastrojejunostomy these entirely disappeared.

CASE III—M. P., forty-five years old, housewife, was sent to the hospital with a diagnosis of gastric ulcer or carcinoma. There was a history of epigastric pain, increased by taking food, and occasional vomiting, in which there had been some blood. During the past six months she had lost forty pounds in weight. There seemed to be a small tumor in the region of the stomach, and an absence of free hydrochloric acid was noted. While under observation and medical treatment no improvement took place, and therefore on September 26 an exploration was undertaken.

After the abdomen was opened by a median four-inch incision just above the umbilicus, the liver was found to be cirrhotic, but, as the stomach showed a slightly thickened and congested area anteriorly near the pylorus and the gastric symptoms had been severe, gastrojejunostomy was deemed proper, and this was accomplished by the Czerny-Petersen method as in the previous cases, but without the button. The gut was opened transversely around its free border to an extent equal to half its circumference and at a point about three inches below the plica.

Recovery was uneventful. Liquid feeding was begun the next day, and all symptoms disappeared, and the patient left the hospital at the end of three weeks, professing to be relieved but without any noticeable gain in weight.

I have since heard that there has been some return of her stomach trouble, and believe this may be due to the cicatricial contraction of the fistula. At any rate, there was no difficulty until the contraction might have taken place. Mayo has called attention, in cases somewhat like this, to the need of artificially narrowing a perfectly patent pylorus to prevent subsequent obliteration of the new fistulous opening. This history, by the way, is not meant to suggest gastrojejunostomy as a routine treatment for the stomach complications of hepatic cirrhosis. It was employed here to relieve a very probable gastric ulcer, which, to be sure, could not be verified, as the interior of the stomach was not explored. The immediate success was marked, and I think the explanation of the recurrence of symptoms reasonable.

CASE IV —A R., twenty-eight years old, housewife, was admitted to the medical service in June with a typical history of gastric ulcer, including hæmatemesis, and while under treatment developed an abscess appendicitis, for which I operated in July. After this had healed, as the gastric distress and vomiting persisted to such an extent that almost no food could be retained and the woman seemed starving to death, I performed a gastrojejunostomy by the Czerny-Petersen method with the Murphy button, as the patient could evidently stand only the briefest interference. The fistula was placed about three inches below the end of the duodenum. The button was reinforced by a continuous suture externally.

Recovery was uneventful. Liquid feeding was begun that night, and from then on all complaints ceased. There was no more pain and no vomiting, and there was a very noticeable gain in the general health. At first this was quite rapid, but later the improvement was more gradual, and seemed the slow gain from a long and severe illness. She left the hospital in good condition, although there was some dyspepsia towards the latter part of the time she was under observation.

In this case I believe again, as in Case III, that in the presence of a perfectly patent pylorus the new fistula underwent cicatricial contraction, and its benefit was at least diminished. The primary improvement and the subsequent cessation of improvement are certainly suggestive.

CASE V—A H, fifty years old, mechanic, had a Hemecke-Mikulicz pyloroplasty for benign stenosis performed by me on December 29, 1902. During the next six months he gained nearly thirty pounds in weight, and then in July, 1903, the former symptoms began to recur. These grew gradually worse, and therefore on October 5, 1903, I made a gastrojejunostomy by the Czerny-Petersen method, placing the anastomotic opening, which was accomplished with sutures, about three and one-half inches below the duodenum. The condition of the pylorus in this operation was interesting. At the completion of the last operation, nine months previously, the index-finger, invaginating before it the anterior wall of the stomach, could easily be passed into the duodenum. Now the pylorus was found practically closed, surrounded by adhesions and high up under the liver.

Recovery was uneventful, and on the eleventh day afterwards I found the patient at work in his shop. All symptoms have been completely relieved, except that he tells me he has to be a little more careful of his diet than formerly. Fermentable foods are apt to cause dyspepsia, but otherwise he is as well as ever. In the months immediately following the first operation he could eat anything, whereas now sugars, starches, and cabbage are not so easily disposed of. This history would seem to indicate, as might be supposed, that gastroduodenostomy is preferable to gastrojejunostomy.

In these five cases there was one death three weeks after operation from an ascending infection of the urinary tract. But in none of them was there anything but satisfaction in the entire relief of symptoms. As they represented respectively cancer, dilated or atonic stomach, ulcer, chronic gastritis (and ulcer?) with hepatic cirrhosis and benign stenosis of the pylorus, they can be said to be examples of successful treatment of nearly all kinds of chronic gastric disorder. And certain enthusiasts have extolled the operation as a panacea in this class of diseases. It is, however, undeniably excellent for benign and malignant stenosis of the pylorus, and for ulcer and atonic dilatation of the stomach. Gastroduodenostomy is physiologically better when possible, and should be given the preference. But when the retrocolica posterior anastomosis is impracticable an antero-

colica anterior loop operation combined with entero-anastomosis may have to be undertaken. There are now a considerable number of observations on record of the late results of gastro-enterostomy for benign disease, especially for ulcer. One of the first and most frequent bad results is contraction of the fistula and recurrence of the symptoms. To prevent this, Mayo recommends a purse-string suture about the pylorus. A plication by infolding of the anterior stomachic wall at this point would be simpler, and ought to be equally effective. At any rate, in the presence of a patent pylorus some method of artificial occlusion is necessary to obtain permanence of results. A retention of the Murphy button can generally be avoided by using Weir's or Hildebrand's instrument, although the assurance as noted above is not very strong. In the presence of hyperacidity, diarrhoea for a longer or shorter time, generally a week or so, may be expected. Peptic ulcers in the jejunum have several times been observed, and some of these have caused death by perforation or hæmorrhage. But as a general thing the motility of the stomach has been vastly improved. Some bile can be always detected in the stomach contents, but never seems to have caused unpleasant symptoms. The development of a sphincteric action in the fistula is questionable, and a matter of more academic than practical interest. There has often apparently been found an impaired digestion for fats, and consequently an excess of such articles of diet is to be avoided. But as a result of my own rather limited experience and from what I can gather from others, a gastro-enterostomy as described above is a most satisfactory operation, and one which sooner or later is certain to come into much more general use than formerly for chronic benign gastric disease. It is already universally accepted for pyloric obstruction, but not as early in the course of the obstruction as it should be. For dilated and atonic stomachs it is undoubtedly preferable to medication. Little can be expected in the way of restoration of the secreting power of the mucous membrane in such a condition, and the drainage is better by gastrojejunostomy than by gastroduodenostomy. For ulcer, with its dangers from hæmorrhage and

perforation, gastroduodenostomy where possible should be the choice. But adhesions which may be present around the pylorus ought to negative the prolonged operation usually necessary to mobilize the parts for accomplishing a proper stomach-duodenum fistula. A simple pyloroplasty too often has failed, and an opening four or five inches in vertical diameter is only possible when the parts are freely movable.


The permanency of any artificial opening and its desirability in the presence of a patent pylorus is of course an ever-present problem. Contraction seems inevitable. The Finney operation escapes it as much as any wound can, and that, in the absence of adverse reports, is an unanswerable argument in its favor. But when this method is impracticable, as it so often is, should the pylorus be artificially closed to insure permanency in the jejunal fistula? Will the fistula not remain open until the conditions for which it is made are cured and then close, leaving everything as it should be? Apparently not. The fistula will close in the majority of instances, at least before a permanent cure is obtained. And therefore it seems necessary to close the pylorus, as only under such conditions has experience shown that the new opening will remain patent. A peptic ulcer of the jejunum is about the worst which can be expected, and with a gastroduodenostomy a similar ulcer in the duodenum is at least equally probable. Gastrojejunostomy, however, as shown in Case V, may involve some minor dyspeptic symptoms. The ulcers, though rare, are serious possibilities inherent in both methods, and the dyspepsia seems slight, therefore, when gastroduodenostomy is impracticable, gastrojejunostomy with closure of the pylorus is far preferable to leaving a patient to suffer from a far worse condition than an occasional discomfort.

BIBLIOGRAPHY

METHODS

- Bastianelli (Reforma Medica, 1894, No 193) In two stages with thermocautery
Boari (Deutsch med Woch, 1898, L B 7, p 40) In two stages with caustics
Bonomo (XI Italian Surg Cong October 1896) In two stages

- v Bramann (Centbl f Chir, 1892, p 101) Retrocolica anterior loop
- Braun (Centbl f Chir, 1892, p 102) Loops with entero-anastomosis
- Brenner (Wien klin Woch, 1892, p 375) Retrocolica anterior loop
- Carle (Arch f klin Chir, 1898, Vol lvi, p 55) Sutures to retain Murphy button
- Chaput (Presse Med, July 14, 1894) Loops with H incision in viscera
- Courvoisier (Centbl f Chir, 1883, p 795) Retrocolica posterior loop
- Crede (Centbl f Chir, 1900, p 65) Retrocolica posterior loop in two stages with perforated silver plates
- Czerny (Petersen, Beitr z klin Chir, Vol xxix, p 597) No loop
- Doyen (Surgical Treatment of Diseases of Stomach and Duodenum, 1895) Valve in afferent loop
- Doyen (Ibid) Tucking omentum through gastrocolic ligament
- Doyen (XI French Surg Cong) "En Y" with crushing of gut
- v Eiselsberg (XXIV Germ Surg Cong) For pyloric cancer, antero-colica, anterior loop with section of stomach isolating the tumor
- Faure (XI French Surg Cong, October, 1897) By invagination of stomach wall into the loop
- Ferguson (American Gynecological and Obstetrical Journal, June, 1900, p 488) By clamps containing a sheathed knife
- Finney (Bulletin Johns Hopkins Hospital, July, 1902, p 155) Gastro-duodenostomy
- Fowler (ANNALS OF SURGERY, November, 1902, p 695) Silver wire constriction of afferent leg of loop
- Gallet (Rev de Chir, 1898, p 1110) Entero-enterostomy with Murphy button held in forceps for introduction into loop
- v Hacker (Arch f klin Chir, 1885, Vol xxxii, p 621) Retrocolica posterior loop
- v Hacker (Centbl f Chir, 1892) With infolding and constriction of afferent loop
- Hall (Lancet, September 6, 1902, p 657) Anterocolica posterior loop
- Henle (Centbl f Chir, 1898, p 753) Gastroduodenostomy
- Hildebrand (Centbl f Chir, 1900, p 657) Modified Murphy button
- Jaboulay (Arch Prov de Chir, 1893, Vol 1, p 429) Loop with entero-enterostomy
- Kappeler (Centbl f Chir, 1899, No 2) Sews loop in broad curve to front of stomach
- Kelling (Arch f klin Chir, 1900, Vol lxii, p 746) Decalcified ivory spools
- Kocher (Centbl f Chir, 1891) Valve of stomach wall in afferent leg of loop
- Kocher (Centbl f Chir, 1903) Gastroduodenostomy by mobilizing descending duodenum
- Kummel (XXV Germ Surg Cong, 1895) Gastroduodenostomy
- Lauenstein (Centbl f Chir, 1891, p 776) Loop of any part of gut
- Littlewood (Lancet, 1900, ii, 1276) With excision of superabundant mucous membrane in fistula

- Lucke (Wien klin Woch, 1899, p 540) Side to side entero-enterostomy
- Martini (Centbl f Chir, 1899, p 1070) In two stages
- Maury (Medical News, September 12, 1903, p 483) Modified McGraw method
- Maydl (Centbl f Chir, 1892, p 654) Jejunostomy preceding gastro-enterostomy
- Mayo (ANNALS OF SURGERY, July, 1903, p 44) Purse-string suture of patent pylorus to prevent obliteration of new fistula in benign cases
- Mayo (Boston Medical and Surgical Journal, May 1, 1902, p 456) Loop reinforced by omental cuff
- McGraw (ANNALS OF SURGERY, 1893, Vol xviii, p 313)  shaped flap incision in viscera to prevent cicatricial contraction
- McGraw (New York Medical Journal, January 26, 1901) In two stages by elastic ligature
- Mikulicz (Mayo, ANNALS OF SURGERY, July, 1903, p 42) Retrocolica posterior without a loop and with transverse opening of gut, like Czerny
- Modlinski (Centbl f Chir, 1899, p 102) In two stages by elastic ligature
- Morrison (British Medical Journal, 1901, ii, p 1144) Roux method "en Y" with side-to-side union by suture
- Mugnai (Clinica Chirurgica, 1900, No 1) In two stages
- Nicoladoni (Centbl f Chir, 1902, No 23) Gastroduodenostomy
- O'Hara (ANNALS OF SURGERY, February, 1901, p 179) By special forceps to prevent infection
- Paul (British Medical Journal, June 4, 1894, p 1440) In two stages with cauterization with zinc chloride
- Podrez (Arch f klin Chir, Vol lvii, p 358) In two stages with silk ligature
- Postinkow (Centbl f Chir, 1892, Vol xiv, p 1018) In two stages with silk ligature of mucosa
- Roux (Rev de gynecol et de chir, Abd, 1897, No 1, and Centbl f Chir, 1898, p 508) Retrocolica posterior "en Y"
- Roux (Bull et Mem de la Soc de Chir de Paris, vi, p 572 Centbl f Chir, 1890, p 792) Suture almost completed before fistula is cut through
- Robinson (New York Medical Journal, October 18 1890 p 429) By raw-lide perforated plates, like Senn
- Robson (British Medical Journal, April 1 1893 p 688) Bone "bobbin"
- Rockwitz (Deutsch Zeits f Chir, 1887, Vol xxi, 555) Isoperistalsis
- Rutkowski (Centbl f Chir, 1899 p 1057) Gastro-enterostomy combined with gastrostomy and tubage, temporarily, of efferent leg
- Rydygier (Centbl f Chir, 1884, p 63) Anterocolica anterior with afferent leg extended on stomach
- Senn (IX Internat Med Congress 1887) Senn's plates

- Socin (Corresps'bl Schweiz Aerzte, 1884) Transverse opening in gut
- Sonnenburg (Schroeter Deutsch Zeits f Chir, 1894, Vol xxxviii, p 296) By invagination of stomach wall into efferent leg of loop
- Souligous (Centbl f Chir, 1896, p 1214, La Semaine Med, 1896 p 283) In two stages by enclosing with sutures areas crushed with angiotribe.
- Sykoff (Arch f klin Chir, 1898, Vol lvi, p 421) By infolding the wall as a valve in afferent leg
- Sykoff (Centbl f Chir, 1899, p 99) Murphy button of decalcified ivory
- D'Ursi (Centbl f Chir, 1893, p 448) Previous extirpation of great omentum
- Villard (Centbl f Chir, 1901, p 46, and Rev de Chir, 1900, No 10) Gastroduodenostomy like Henle
- Weir (Medical News, June 3, 1899, p 680) Murphy button introduced through loop, and entero-enterostomy made by pressing together through unopened gut
- Wolfer (Centbl f Chir, 1881, p 705) Original operation
- Wolfer (XII Germ Surg Cong, 1883) Constriction of afferent leg by circular silk ligature
- Wolfer (XII Germ Surg Cong, 1883) Valve from stomach wall over afferent leg

There are in addition the numberless methods by mechanical appliances used in intestinal anastomosis, including Ech's instrument for portal-caval anastomosis

STATISTICS AND RESULTS

- Braun (XXIII and XXIV Germ Surg Congress) Peptic ulcers of jejunum
- Brenner (Arch f klin Chir, 1893, No 45)
- Chlumski (Beitr z Chir, xx, Hefte 1 and 2)
- Cordier (Journal of the American Medical Association, March 1, 1902) Case of retained button lasting seven years
- French Surg Congress, 1897
- Gibson (ANNALS OF SURGERY, 1898, p 284)
- Jaworski (Deutsch med Woch, 1899, No 14) Late results
- Kaiser (Deutsch Zeits f Chir, Vol lxi, 294) Late results
- Kappeler (Deutsch Zeits f Chir, Vol xlix, p 113) Late results
- Kelling (Arch f klin Chir, Vol lxii, 1900, p 5) Late results and physiology
- Mayo (International Journal of Surgery, February, 1902)
- Mayo (ANNALS OF SURGERY, July, 1903)
- Mikulicz (Grenzgebiete, 11, 251)
- Peham (Deutsch Zeits f Chir, 1898, Vol xlviii, p 484)
- Steinthal (Centbl f Chir, 1900, Nos 70 and 71) Peptic ulcers of jejunum

GASTRIC DILATATION AND TETANY.

BY JOHN H CUNNINGHAM, JR , M D ,
OF BOSTON, MASS

THE following case, which has been periodically under the writer's observation for the past twenty-five months, is from the service of Dr Francis S Watson of the Boston City Hospital, and to this gentleman I am indebted for the privilege of reporting it The comparative rarity of this disease, the high mortality under medical treatment, and the good results derived from the few cases treated surgically, make this case worth recording

Male, single, twenty-eight years old, born in Boston, a collector by occupation He entered the Boston City Hospital on the medical service of Dr Charles F Withington, March 11, 1902

Family History — Father died of heart disease Mother with cancer of groin One sister living and well

Past History — Measles, whooping-cough, and scarlet fever in childhood Indefinite history of rheumatism Denies any venereal disease No history of hæmatemesis could be obtained

Habits — Moderate use of tea Occasional beer and whiskey No coffee No tobacco for past ten years

Present Illness — Since 1896 the patient has had attacks of vomiting without known cause, which lasted one or two weeks These occurred at intervals of weeks or months During the attacks there was a constant dull, heavy, epigastric distress For the first day or two of the attack he could eat a little toast and tea for breakfast without vomiting, but any ingestion of food later in the day or attack would cause him to vomit During the attacks he was always obliged to give up work on account of weakness, epigastric distress, and a sense of general ill being, and spent most of the time in bed During these periods it has been his custom to eat very little

The loss of weight following the attacks has always been evident to the patient

About six months after the beginning of the gastric disturbance the patient began to notice difficulty in distinguishing objects, both near and far. This gradually increased, so that three months later he was fitted with a pair of glasses by an optician. The glasses relieved this difficulty in great measure, but not entirely. During the attacks of vomiting it was with difficulty that he could distinguish the outline of objects, and later he could only distinguish light.

Between the attacks he could distinguish objects fairly well, and could read ordinary print. If, however, he left the glasses off, he immediately became nauseated and frequently vomited. This became so evident to him that he wore his glasses until getting into bed, when he placed them within reach and put them on immediately upon awakening in the morning.

During the interval between the attacks (usually four to eight weeks), he lived chiefly on soups, broths, and common proprietary predigested foods, and was able to do his duties as a collector.

On January 16, 1902, he began to have severe epigastric distress and belched more wind than previously, but passing wind by rectum was absent, as on all previous occasions. During the following two days he vomited everything ingested, which vomitus contained food eaten several days previously. Tingling of the hands, which he had noticed occasionally after vomiting, became more marked, and lasted about half an hour after each severe attack of vomiting.

On January 18, 1902, he was admitted to the Gouverneur Hospital of New York, where he remained fifteen days. He continued to vomit several times daily, and the vomitus occasionally contained "strings of blood." He was kept in bed and fed by mouth while in the hospital, and was discharged, being much relieved. Attempts at this time to pass a stomach-tube failed, and produced tingling in the hands and contractions of the fingers.

During the two months after his discharge from the Gouverneur Hospital, and previous to his entrance to the Boston City Hospital, the patient continued to vomit almost daily after the ingestion of food, which consisted, as before, of soups and broths. Tingling and numbness of the hands became pronounced.

The vomiting occurred about fifteen to thirty minutes after

eating The vomitus was oftener larger in amount than the food ingested It never contained blood, and was light colored and sour He belched much sour, foul gas at all times

He has been unable to work and has spent parts of each day in bed

During the past two months the patient has lost thirty-five pounds by actual weight, and much in strength He has been troubled with constipation for the past ten years, and previous to his first severe gastric disturbance had taken cathartics regularly

There are no symptoms referable to the other systems

Physical Examination—A well-developed, poorly nourished man, pale and slightly anæmic Not cachectic Eyes pupils equal, motions and reactions normal, four millimetres Thick white coat on tongue Breath foul Throat slightly reddened Neck normal Pulse, equal, regular, fair volume and tension Heart area, upper border, third rib Right border, two and one-half centimetres to right, and left, ten centimetres to left of a median line Apex impulse in fifth costal interspace Action regular Sounds clear No murmurs Lungs show good resonance respiration throughout without râles Liver-dulness extends from the fifth rib to the costal margin Edge not felt Spleen area normal and organ not felt Abdomen slightly retracted Soft Tympanitic Moderate general tenderness Contour of stomach could not be made out by percussion or auscultation No tumors Extremities normal without œdema No enlarged lymph nodes Knee-jerks, plantar reflexes, cremasteric and abdominal reflexes, equal and exaggerated Temperature, 99° F, pulse, 100

Urine Examination—High color Sp gr 1032 Moderately acid A slight trace of albumen No bile or sugar Urea, 22 Many hyaline and coarse granular casts

During the examination the patient vomited thirty-two ounces of a sour-smelling, chocolate-colored fluid (color probably due to some chocolate drank just before admission to hospital) Vomitus contained no macroscopic blood and only an occasional blood-corpuscle microscopically Total acidity, 0.48 Free HCl, 0.32 Lactic acid absent Many sarcinæ and bacteria

Immediately after the vomiting the patient had a typical

attack of tetany The attack was equal on both sides The thumbs were drawn in under the fingers, which were flexed at metacarpophalangeal joint, and very rigid The wrists were flexed The arms were flexed at the elbows and rotated inward so that they lay across the chest The upper legs were in about one-half flexion and the lower legs in complete flexion upon the thighs The flexions were strong, but both the upper and lower legs could be partially extended, the greater motion being in the hip-joint The lips were firmly flexed, although not much drawn back, and the patient was unable to speak The pupils were moderately contracted The pulse rapid and high The spasms lasted between two and three minutes, and were repeated several times at intervals of three to ten minutes, but were milder each time Trousseau's symptom was present in both arms and to a less degree in the legs Chvostek's symptom could not be satisfactorily demonstrated

After the attack the patient complained of pain in the flexor tendons of both wrists, and said that he was conscious of what had taken place, but was confused in mind while the attack lasted The hands remained numb for about half an hour

A *test breakfast* three days after entrance showed a total acidity of 3 free HCl, 0.18 Lactic acid absent No macroscopic and an occasional microscopic blood-corpuscle Many sarcinæ and bacteria The test breakfast was recovered by vomiting during an unsuccessful attempt to introduce the stomach-tube

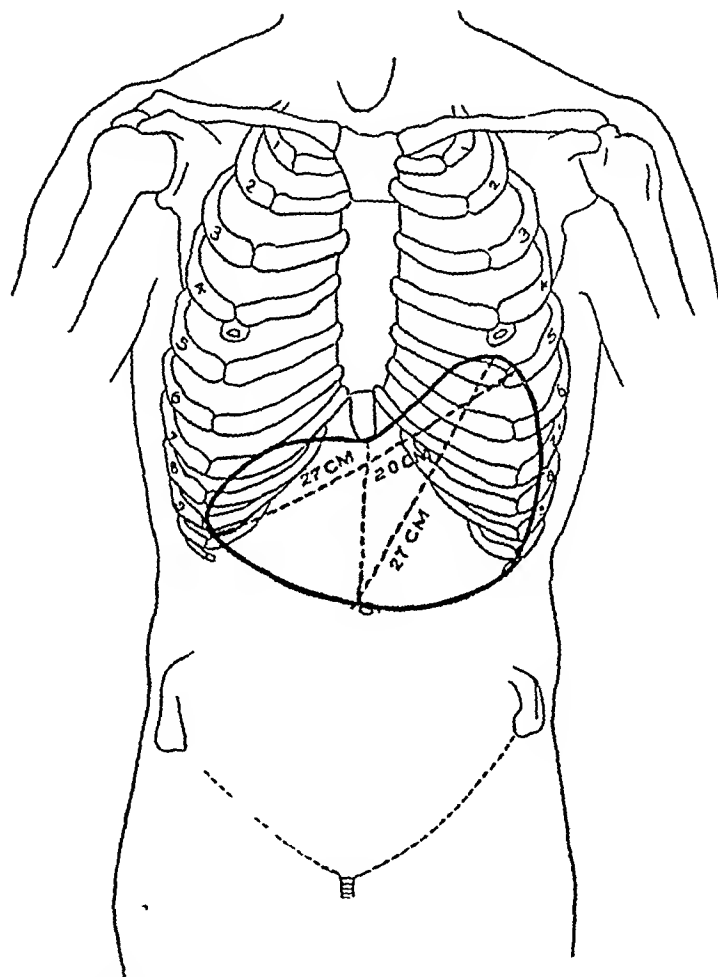
The patient was put on a liquid diet and always vomited within twenty minutes of ingestion Between the ingestion of food he occasionally vomited an ounce or more of a viscid, whitish fluid not unlike mucus He continued to belch wind, which together with the vomiting was little relieved by anti-fermentatives

Five days after the first attack of tetany there was a milder attack following vomiting The contractions were as previously noted, and lasted about two minutes, and the patient complained of numbness in the fingers, which lasted one-half hour, and during which time there was marked diminution in pain, temperature, and touch sense

Two days later an unsuccessful attempt to pass a stomach-tube brought on an attack of tetany more severe than the previous and lasted eight minutes The parts affected were as previously

noted In this attack the toes were flexed onto the dorsum of the foot, and the tendons over the dorsum were prominent The thighs could be extended at the hips with ease, but no passive motion could be produced in the knee-joint The abdominal muscles were also very rigid The knee-jerks, cremasterics, and abdominal reflexes were very lively throughout the attack No

FIG 1



Percussion area after distention with tartaric acid and sodium bicarbonate before operation

plantar reflex could be obtained, the toes remaining in strong flexion onto the dorsum of the foot Passive motions and massage were very grateful to the patient

The size of the stomach was determined by divided seidlitz powders with percussion Areas as in diagram (Fig 1)

Peristaltic waves were noted for the first time before and after the administration of the seidlitz powder The waves ran

from the left to the right hypochondrium directly across the epigastrium

Dr Withington, feeling that the tetany was due to pyloric obstruction, had the patient seen by a surgeon, who advised operation, but as the patient had begun to take his food better he refused. Ten days after admission to the hospital the vomiting gradually diminished and the patient took nourishment better. He gradually improved in general condition as the vomiting and tetany ceased, and he was discharged, after being in the hospital twenty days, with the diagnosis of "gastric tetany dependent upon pyloric obstruction and gastric dilatation probably of a benign character."

After discharge from the hospital the patient continued to improve in general condition, but remained on a semisolid diet and took cathartics regularly.

After four months he started a lunch cart, which he was able to run, with occasional absences for two or three days on account of gastric distress and general debility. He had no further attacks of vomiting or tetany.

On March 2, 1903, nine months after discharge from the hospital, the patient, not having been seen for four days, was found in his lunch wagon, where he had been unconscious for this length of time. When found, he was having convulsions, and there was vomitus everywhere on the floor. He was unconscious, and was taken immediately to the City Hospital Relief Station.

The general physical examination at that time was as previously noted. He was subsequently transferred to the main hospital, where he was admitted to the medical service of Dr E W Buckingham.

The patient states that he had been having gastric disturbance for several days and had occasionally vomited, following which he had twitching and numbness of fingers. The last he remembers was attempting to fill an oil-can, and when four days later he regained consciousness, he was in the hospital.

His vomiting subsided after transfer from the Relief Station, and he had no further attacks of tetany.

For aid in observing the case while on Dr Buckingham's service, I am indebted to my friend, Dr Fritz W Gay, at that time House Physician to Dr Buckingham's ward.

Test breakfast showed practically the same analysis as one year ago

Blood Examination—Leucocytes, 9000, reds, 4,900,000, hæmoglobin, 60 per cent

The urine at this time gave evidence of more active renal disorder. It was pale. Sp gr 1011, strongly acid. Very slight trace of albumen. No bile. No sugar. Urea, 1.4. A few hyaline and fine granular casts with many small round cells adherent (renal). Many small round cells (renal). Small amount of fat, free and adherent to small round cells.

There were no symptoms subjective or objective referable to the renal condition. The temperature remained about normal and the pulse was always below 100 and above 70, and of good volume and tension.

The patient remained in the hospital ten days, at the end of which time he was discharged, relieved of the immediate inconvenience, and again refusing operative interference.

On October 27, 1903, the writer was called to see the patient and found him in a severe attack of tetany. The contractions were more pronounced than in previous attacks. When lying on his side the knees were drawn up under the chin, the lower legs strongly flexed upon the thighs. The feet were flexed to their full extent. The face showed well-marked trismus and the angles of the mouth were considerably drawn out. The pupils were contracted and were about three millimetres. The muscles of the neck and back were not affected, but the abdominal muscles were very rigid. The arms, wrists, and fingers were in tetanic contractions as before noted.

The patient was semiconscious, understood what was said, but could not speak. Pulse, 126, poor volume and tension.

The attack lasted about one hour. It was learned that for the past week he had been vomiting after everything eaten, and had attacks of tetany several times daily, often lasting twenty minutes.

The patient was sent to the Boston City Hospital immediately, and was admitted to the surgical service of my former chief, Dr Francis S. Watson, through whose courtesy I was able to follow the case.

The general physical examination was at first admission to the hospital, except that the patient's condition had failed con-

siderably The outline of the stomach was visible in the epigastrium, and the greater curvature was visibly distinct at the level of the umbilicus without any dependent area of dulness or clapotage Peristaltic waves were visible, running from left to right over the stomach area These peristaltic waves could be made more evident by placing a cold hand over the epigastrium or flicking it with a towel wet in cold water

Urine examinations as previously noted on Dr Buckingham's service

The patient complained of much pain in all the parts involved in the tetanic contractures for hours after they had ceased

His condition began to improve twenty-four hours after admission to the hospital and the tetany and vomiting became less Trousseau's symptoms could always be produced by a moderate degree of pressure over the brachial plexus and vessels several minutes after the contractures had subsided Chvostek's symptom became evident about the mouth by a tap with the finger over the course of the facial nerve, and could be produced in a less degree in the extremities by taps over the respective motor nerves The temperature, as on previous stays in the hospital, continued normal

Operation two days later by Dr Francis S Watson—After etherization a stomach-tube was passed for the first time, and the stomach thoroughly washed with normal salt solution, removing much dark, turbid fluid, and without producing tetany All previous attempts to pass the stomach-tube had failed, the patient vomiting violently and immediately developing well-marked tetany, although on no occasion did the tube pass more than half-way to the stomach

Through a median incision the stomach was found considerably enlarged, the walls thin and atonic, and the vessels much dilated The right kidney was not abnormally situated or mobile

The stomach surface was negative except at the pylorus, where palpation showed there was thickening and induration The surface was smooth, without adhesions, and gave no visual evidence of a pathological condition other than thickening at the pylorus

A posterior gastrojejunostomy was performed, observing the point urged by Mayo, viz, that of attaching a loop of jeju-

num to the most dependent portion of the greater curvature The communicating openings were made at least three inches in length

The incision was closed without drainage and united *per primam*

Course of Case following Operation—The patient was put on rectal feedings and received only warm water, in two-drachm doses by mouth for three days, after which time broths were given in increasing amounts and the rectal enemata were gradually omitted, so that on the fifth day following the operation the patient was on a liquid diet

The wound healed by first intention and the stitches were removed on the tenth day

The convalescence was uneventful, the temperature and pulse remaining normal at all times The patient relished the liquid diet, which was gradually increased, so that twelve days after operation he was taking full hospital diet which included meat stews and potatoes

From the time of operation on, he was free from all gastric symptoms, and relished full hospital diet, including steak, chops, and chicken

He gained steadily in weight and strength He was up on the twenty-first day after operation with a fitted abdominal swathe Two days later he complained of pain in the left leg, and upon examination a phlebitis extending along the course of the long saphenous vein from the ankle to the groin was found This subsided after two weeks' constant poulticing

At the time of discharge from the hospital, seven weeks after operation, the patient expressed himself as being heavier and in better strength than he had been for fifteen years, but suffered the inconvenience of moderate swelling which persisted after the phlebitis

The stomach area determined by percussion and auscultation at different times showed it to be much smaller than before operation

Course of Case after Discharge from the Hospital—Word occasionally received from the patient showed steady increase in weight and strength, with absolutely no return of gastric symptoms or signs of tetany The bowels continued regular, one or two movements daily without the use of laxatives The informa-

tion obtained in reference to diet showed that the patient was eating all sorts of food except pastry. The writer was, however, informed by his sister that the patient was very irregular about his meals, and ate everything, including corn beef and cabbage, mince and apple pie, and fruit in abundance. She also regretted that he chewed considerable tobacco and smoked much, but was pleased to note an entire change in the patient's disposition, which for years had been very disagreeable.

The swelling in the left leg following the phlebitis persisted, and the patient wore a silk rubber stocking during the day.

The patient was seen on January 6, 1904, nearly three months after operation, having gained twenty pounds in weight since his discharge from the hospital. His appearance was entirely changed, and there had been absolutely no gastric symptoms or signs of tetany. At this time he weighed 150 pounds. The patient stated that he was eating everything in large amounts and felt he could not get enough, his bowels were regular without laxatives, and he would be at work except for the swelling in the leg, which bothered him considerably, especially over the dorsum of the foot. He admitted eating pastry of all sorts and chewing tobacco, and said he smoked several pipefuls of tobacco daily and occasionally a cigar, but that he had used no liquor except a few glasses of beer.

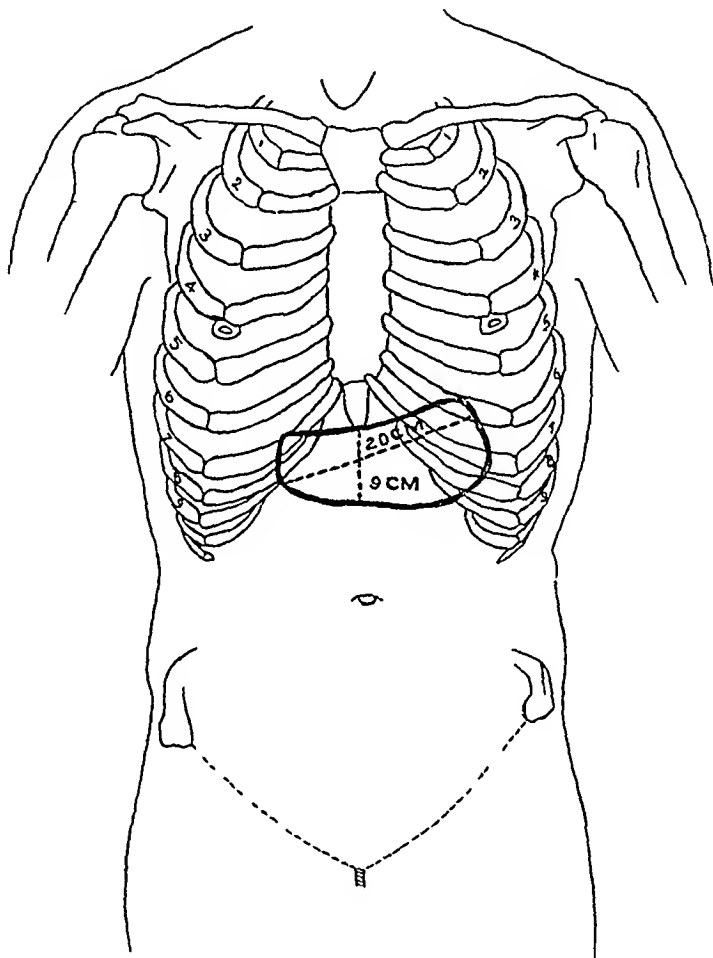
He expressed much gratification at the improvement in his eyesight, and said that he could distinguish objects and print now much easier without his glasses than he could before with them, and that he had not worn the glasses for many days without any of the gastric symptoms which used to follow when he left them off.

Divided seidlitz powders given at this time produced loud gurgling in the epigastrium and lower in the abdomen. The stomach area, percussed as quickly as possible, showed the area as in Fig. 2.

The patient expressed a sense of fulness in the epigastrium after the administration of the seidlitz powder, but this disappeared in less than three minutes. By comparison of Figs. 1 and 2, the relative size of the stomach before and after operation is certainly striking. The diminution in the size of the stomach, the gurgling and the quick disappearance of the sense of fulness, are good evidence that there is a large outlet between the stomach and the intestines.

Urine—Color normal Moderately acid, 1018 No albumen or sugar Urea, 31 Sediment, occasional small round cells (renal) Cryoscopy, 210

FIG 2



Percussion area after distention with tartaric acid and sodium bicarbonate three months after operation

The patient has since been seen several times, the last occasion being on March 9, 1904, which is five months after operation. On this date he weighed 172 pounds. He has been absolutely without gastric symptoms or suggestions of tetany, and says, "I was never so well in my life." He is irregular in his meals, which consist of everything, and he uses alcohol in moderation.

The size of the stomach at this time was practically as at the last examination, which is recorded in Fig 2.

The *urine* is normal in all respects, and a cryoscopic freezing-point of 29, and an urea elimination of 38 shows a normal renal function.

The long period of time which the patient has been under observation and his high degree of intelligence have helped the writer considerably in recording the case

Beside presenting the typical picture of long-standing gastric dilatation and stasis with subsequent tetany, there are special points of interest regarding the case. Aside from remarking that the duration of the disease and the severity of the tetany are one of if not the most severe in the literature, nothing further than that which has already been noted is to be said about the character of the tetanic seizures

Leaving aside the primary mechanical cause of the obstruction, which was revealed at the operation, and considering the immediate cause of the tetanic seizures, it is interesting to note that the stomach-tube was at no time passed into the stomach until the patient was etherized for operation. This fact is interesting in reference to the reflex theory of Germain-Sée and Berlitzheimer. Although the stomach-tube did not reach the stomach, its passage beyond the pharynx caused severe vomiting. The tetany following such attempts to pass the tube was unquestionably reflex, and the spasms were due to reflex action through the nerves of the pharynx and œsophagus or, possibly, from the stimulation produced by the vomiting as a sequence to the unsuccessful attempts to pass the tube.

The examinations of the *stomach contents* at various times during the twenty months that the patient was under observation before operation show it to be light colored, always acid,—without macroscopic blood and only an occasional microscopic corpuscle,—sarcinæ and bacteria were usually numerous even with the acid reaction. The total acidity was never much increased over normal, which is also true of the free hydrochloric acid. Lactic acid was invariably absent.

By comparison of *Figs 1 and 2*, showing the size of the stomach before and after operation, it is interesting to note the diminution in the size of the organ. It previously measured twenty centimetres in the median line and twenty-seven centimetres in its longest diameters, while following the operation its median dimension was nine centimetres and its longest axis twenty centimetres.

The *urine* examined during the attacks of vomiting and tetany showed marked concentration, which is in keeping with the observations of others. The color was always dark, the specific gravity high, moderately acid, and albumen was always present in small amounts. There was no bile or sugar at any time. The urea was diminished and hyaline and granulated casts were always present, and sometimes associated blood, renal epithelium, and fat. There was no difficulty in micturition, as described by some, and attributed to spasm of the bladder sphincter. Between the periods of vomiting and tetany, and after discharge from the hospital, the urine was passed in normal amounts, of normal specific gravity and color, less acid, and with only the slightest possible trace of albumen. The urea remained slightly diminished, and only an occasional hyaline or granular cast was to be found in the centrifugalized urine. Since operation the amount has remained practically normal, the albumen disappearing entirely, and rarely a hyaline cast can be found. The urea is eliminated in normal amounts, and the cryoscope freezing-point shows the kidneys to be secreting the normal amount of solids.

The interpretation placed upon the urine during the attacks of vomiting and tetany must be in favor of the supposition that some toxine is acting upon the kidney structure during the process of its elimination.

The *blood* examination while at the hospital showed a moderate secondary anæmia and slight leucocytosis, which, since discharge after operation, has entirely disappeared. It is to be regretted that cryoscopy of the blood, together with the urine, could not have been done during the attacks of tetany, and one is unable to remark upon Kussmaul's theory of concentration of the blood in this disease as the immediate cause of the tetany.

The *eyes* are of considerable interest, becoming affected early in the gastric disturbance (in 1896), causing him much inconvenience, and being a constant stimulus in producing vomiting and tetany whenever he attempted to go without his

glasses Their improvement since operation is certainly remarkable

The pupils during the attack were contracted, which is in accord with the observations of Bouveret and Devic, and contrary to those of Tresilian and Kussmaul

It is unfortunate that no ophthalmological report of the eyes at an early stage is to be had An examination by Dr Myles Standish, of the Harvard Medical School, on January 14, 1904, is as follows

Ophthalmological Examination O U V = 20/100

O D V = 20/100 with +2.00 + 50 ax 90° v = 20/20

O S V = 20/100 with +2.00 + 50 ax 90° v = 20/20

Near vision = Snellen type, 1 25 D

Esophonia, 11°

"In short, his ocular conditions are such that he maintains binocular single vision only with the greatest difficulty, and any disturbance which upsets his nervous balance would be likely to produce the symptoms of which he complained"

It is evident from Dr Standish's examination that there are certain abnormal conditions of the eyes which have always existed independent of his gastric condition

The patient's belief that his eyes are so much better is partially true, and is dependent upon his improvement in general health, the mechanical abnormalities of the eyes, however, still remaining

The *motor aphasia* during the attacks and the comparatively slight involvement of the sensory speech area are certainly worthy of note

The feebleness and rapidity of the *pulse* which has been noted during the tetanic spasms are confirmatory of the observations of others, and is explained by Dickson as being due to spasmodic contractions of the blood-vessels themselves

The *temperature* remained about normal, but was more frequently below this point than above

The *reflexes* were always normal in character but considerably exaggerated, and during the attacks those which were not involved to the degree of spasticity showed marked increase

The reflexes three months after operation were all slightly exaggerated, but less so than at any time since the patient has been under observation

Symptoms —The symptom, tetany dependent upon gastric dilatation, and known as gastric tetany, is to be differentiated from the tetanic spasms occurring in gastro-enteritis, pregnancy, thyroidectomy, the puerperal state, acute fevers, and the carpopedal spasms associated with rickets. also from those produced from toxine substances, as in lead and morphine poisoning, etc., and from the diseases of the nervous system, such as epilepsy, hysteria, and the definite lesions of the spinal cord, *e g*, syringomyelia. The epidemic form described by Frankl-Hochwart is apart from the subject, and is not to be considered

Gastric tetany dependent upon dilatation of the stomach was recorded by Kussmaul only as far back as 1869. The tetany of gastric dilatation is usually dependent upon pyloric stenosis, subsequent dilatation and hypertrophy of the organ, and associated stasis and hyperchlorhydria. The pyloric obstruction is usually benign, due to cicatrization of a gastroduodenal ulcer, and gives rise to a series of tetanic contractions which are fairly characteristic. The obstruction may be malignant, as in the cases of Trevelyan, Bouveret, and others, or may be dependent upon pressure from other organs.

The attack of tetany most commonly follows severe vomiting, or less frequently after emptying and lavage of the stomach.

Usually the first symptom is pricking and numbness in the hands. This early symptom, as a rule, is of so little inconvenience to the patient that it is frequently overlooked unless the surgeon puts the question direct. Later in the disease there may be an aura of fatigue, and the attack is usually preceded by severe vomiting.

Tetanic contractions appear in the hands, the fingers being flexed at the metacarpophalangeal joint, and the outer phalanx usually extended. The thumb is adducted into the palm of the hand. The wrists are either strongly flexed or less frequently

extended The lower arm is flexed at the elbow and rotated across the chest The legs are flexed at the hips and knees, the ankles and toes flexed or extended The face occasionally shows trismus, with the corners of the mouth considerably drawn out Transitory blindness has been recorded by Kussmaul and Bouveret The patient may remain conscious and quiet, motor speech being involved, or delirious with absence of sensory speech The muscles of the neck, chest, back, and abdomen are less commonly involved The limbs are sometimes tense and œdematous and the patient may be cyanotic

The attacks last for a few minutes, occasionally or frequently repeated, or may even continue for days and weeks These prolonged cases are almost invariably fatal

The groups of muscles usually involved are in the order above stated

Certain symptoms—Trousseau's, Chvostek's, Erb's, Hoffmann's—are usually present

Trousseau's Symptom—As the attack subsides, pressure over the principal nerve-trunk or blood-vessels, enough to impede the venous or arterial circulation, will reproduce the paroxysm

Chvostek's Symptom—A slight tap over the principal nerve, for example, the facial, will throw its muscles of distribution into spastic contractions, giving evidence of the increase of the mechanical excitability of the motor nerves

Erb's Symptom—A faradaic current applied over nerves and muscles shows great increase of electrical irritation

Hoffmann's Symptom—Slight pressure over the sensory nerves gives evidence of their increased excitability as shown by paræsthesia in the region of their distribution

After the attack has passed off, great pain is experienced in the parts involved, and massage and passive motions are very grateful to the patient

Tresilian reports a case in which blindness lasted for three days, associated with aphasia for one day Kussmaul records a similar case These men record the pupils as widely dilated and

not reacting to light during the attack, while Bouveret and Devic record the pupils as usually contracted

Etiology—Kussmaul, Germain-Sée, Berlitzheimer and others, Bouveret and Devic, have presented the most probable theories, based upon experiments, to explain the cause of gastric tetany

Kussmaul's Theory—This theory considers the loss of fluid from the tissues of the body to be produced by increased secretion of the gastric mucosa, frequent vomiting, and the inability of the tissues to regain sufficient fluid by absorption from the gastro-enteric tract To support this theory he parallels the contractures in cholera, which he considers also due to concentration of the blood by loss of its fluid in the stools, but now known to be due to the toxines absorbed from the intestinal canal Without explanation, he believes that the inspissated blood affects the motor centres of the nervous system

Fleiner and Jurgensen state that there is diminution in the amount of the blood serum, and, therefore, a fall of blood-pressure is probable Other investigators have failed to find diminution in the amount of the blood serum This theory, *per se*, has few adherents, but very likely remains as a casual factor

Germain-Sée, Berlitzheimer—These men, together with Muller, Collier, and others, have explained the tetanic spasms as being reflex action produced by stimulation of the sensory nerves of the stomach Certain facts are given in proof of this theory, namely, the usual onset of the tetany following an attack of vomiting or passage of the stomach-tube Albu states that the stimulation of the sensory nerves of the stomach is not the underlying factor, but only the momentary cause of the spasm As an analogy he cites strychnine poison in the frog and tetanus in man, in which conditions convulsions are produced by irritation of the nerve ending in an already existing pathological condition

Bouveret's and Devic's Theory—This theory is dependent upon the belief of auto-intoxication due to prolonged and ab-

normal chemical processes of digestion in certain cases of gastric retention and hypersecretion

Bouveret and Devic, in three cases of tetany with gastric dilatation, isolated a substance, soluble in alcohol, from the stomach contents which was closely allied to syntom¹, and identical with the peptotoxine of Brieger. This substance, when injected into the circulation of animals produced general convulsions. Frankl-Hochwart, however, state that these cases were never proven to be gastric tetany, as the symptoms of Trousseau, Chvostek, and Erb were all absent.

Following this experiment, Albu, Gumprecht, Landsteiner, Blazicek, Berlitzheimer, Von Jaksch, and Dickson failed to produce tetanic convulsions by injecting untreated gastric contents into animals.

Bouveret and Devic admit that a new substance is produced in the extraction of the toxine by alcohol which does not pre-exist in the gastric contents.

Elaborate chemical experiments by Halliburton and McKendrick further complicate this theory and make it so speculative that it cannot readily be accepted. The employment of alcohol by Bouveret and Devic may in itself have been the cause of the convulsions produced.

Dickson, in experiments by subcutaneous injections into rabbits and guinea-pigs with the following solutions of untreated stomach contents, removed from a patient three days after the onset of the tetany, failed to give any evidence of convulsions or paralysis.

- 1 Filtrate of unaltered stomach contents
- 2 Filtrate of stomach contents evaporated to dryness, *in vacuo*, over strong sulphuric acid at a temperature of 40° C and extracted with normal saline solution
- 3 Filtrate of stomach contents evaporated as in No 2, extracted with alcohol, again evaporated to dryness, and then extracted with normal saline solution

Hyperchlorhydria and sarcinae have been present in the great majority of all cases reported. None of these, however, can alone justly be considered as the etiological factor.

No one of the three theories presented can be considered as embodying the true cause of the contractions, and it may even be doubted if the three together cover all the etiological elements involved in this disease

The third theory, that of auto-intoxication, is, however, most in keeping with the known conditions in other diseases, and is the one usually accepted

Albuminuria has been an almost constant symptom in the reported cases of gastric tetany, although post-mortem findings have failed to give evidence of renal disorder. The albuminuria is probably due to the elimination of concentrated toxic elements, and cannot in any way be considered an etiological factor, as renal symptoms have been consistently absent. Diminution in the amount of urine has been almost constant, and has been invariably concentrated with evidences of lessened metabolism

Local Conditions —Post-mortem and operative examinations show ulcers in various stages of cicatrization, most commonly in the duodenum as reported by Bamberger, Renbers, Dujardin-Beaumetz, and others. Less frequently both in the duodenum and stomach as reported by Moynihan, Loeb, and Neumann. The reported cases of Trevelyan, Bouveret, Devic, and Riegel show malignant disease of the pylorus to be a fairly common factor in producing gastric dilatation and subsequent tetany. The pyloric obstruction is occasionally produced by pressure from growths in or abnormal positions of, certain organs in the abdomen, for example, the right kidney

Blazicek records a case in which the dilatation was dependent upon a large gall-stone. Berlitzheimer's case showed the obstruction to be due to pressure from a pancreatic cyst upon the duodenum. A case of hour-glass stomach producing gastric tetany is reported by Muller

Prognosis —Statistics by various authorities show that the prognosis is very grave. The mortality is high, and recovery without operation is comparatively rare

The fatality of the recorded cases is startling. Series of cases by different authorities are as follows. Frankl-Hochwart,

eleven cases, ten died, Bouveret and Devic, twenty-three cases, eighteen deaths, Albu, forty cases, thirty-one died, Riegall, twenty-seven cases, sixteen deaths. The mortality figured from these cases and as stated by other authorities is between 70 and 80 per cent, and nearer the latter than the former.

The etiology of the obstruction, although the primary cause, plays a minor part in the gravity of the prognosis, the real pernicious factor probably being that unknown factor which is the immediate cause of the tetany.

It is the rule that death occurs sometime after the tetanic seizures have become well developed by failure of the patient to respond to treatment. However, Marten and Trevelyan each report a case which proved fatal within a few hours of the first attack.

Besides the serious danger of the patient's dying during the actual attack of tetany, there is always the probability of its recurrence and certainty of ultimate death.

Treatment—Until recent years the treatment of gastric tetany has been entirely medical, and as yet the number of cases treated surgically is perhaps too small to admit of just comparison. However, the relatively large number of cases treated medically show a mortality in the vicinity of 80 per cent, while, so far as the writer can find from a careful search of the literature, the surgical cases show a mortality of 37.5 per cent.

The medical treatment is directed towards emptying the stomach of its residuum and keeping it so, thereby eliminating whatever toxic substances may enter the circulation or cause the tetany from this source, and also to thus improve the tone of the stomach and the motor insufficiency.

At the onset of an attack of gastric tetany the organ should be emptied by an emetic or, if possible, the stomach-tube. Even after the vomiting which frequently precedes the attack considerable putrefying material will still remain in the stomach. Trousseau found that ice applied over the spine was beneficial in some cases. Others advocate placing the patient in a tepid bath just as soon as the spasms begin, and, if the case is not chronic, to continue the baths three or four times daily, at a temperature

of 30° C Sedatives, usually the bromides, and also morphine, are to be administered during the attack, and if the paroxysms occur frequently, sedatives are to be continued with regularity It is a question, however, if any drug diminishes the violence or frequency of the spasms It may be found an advantage to keep the patient on rectal feedings as long as the vomiting persists, and lavage should be carried on in those cases in which it is possible

Between the attacks thorough lavage is to be practised often enough to remove the stomach's residuum and to prevent putrefaction A small, easily digested diet should be given and strict attention must be paid to keeping the bowels open Also the general health and hygienic surroundings of the patient must receive careful attention

Various solutions have been advocated as the medium with which to cleanse the stomach, chiefly mild antiseptics That adopted by Professor Greenfield is, perhaps, the best known By means of the stomach-tube he empties the organ and cleanses it thoroughly with a solution of sodium phosphate, two drachms to the pint, boric acid, or Condly's fluid He then leaves in the stomach a solution of sodium phosphate, two drachms to the pint of hot milk

Medical treatment undoubtedly does much to aid the patient through the immediate attack How much it improves the tone of the stomach, lessening the motor insufficiency and overcoming the stasis, is questionable, and it is certainly true that the underlying factor, the mechanical obstruction, which causes the dilatation, cannot be overcome in this way and still remain

Even relieved of the symptoms the patient is still an invalid, with the chances of an early recurrence and unfavorable prognosis regarding life constantly before him

In view of the improvement in the technique of gastric surgery, the brilliant results obtained in the last cases in the small series which have been operated should necessarily make surgical procedures in this disease more common in the future than in the past With the exception of Mayo Robson's cases, in which the duration and severity of the tetany is not minutely

recorded, but may have been present for some time, all the patients were in the *extremis* of the disease

In all the cases operated upon, gastric dilatation with obstruction of the pylorus dependent upon some definite lesion was found. Although the writer, with others, believes that practically all cases of gastric dilatation, motor insufficiency, and stasis unrelieved by medical treatment should be operated upon, one must insist that those cases which develop tetany as a sequence should be operated upon immediately following the onset of such symptoms. The mortality of about 80 per cent in the cases of tetany treated medically show that the disease is a very serious one.

Whatever may be the especial cause or effect upon the general system by the symptom, gastric tetany, is speculative, yet it is certainly severe and much more serious than gastric dilatation alone, from whatever cause. The primary underlying factor is pyloric obstruction, the inability of the patient to hold the proper amount of nutrition in the stomach, or, if able to retain the sufficient nutrition, the inability through motor insufficiency to force it into the intestines because of the small lumen of the pylorus.

The pyloric obstruction, if sufficient to cause dilatation, motor insufficiency, and stasis, and to produce gastric tetany, is too serious a condition to be overcome by medical treatment, and operative interference is necessary to establish a sufficient outlet of the stomach into the intestines.

Gastro-enterostomy, pylorotomy, and pyloroplasty are indicated. In view of the statistics of Robson, Mayo, and Munro, regarding these operations in benign cases, the procedures in themselves are shown to be accompanied by a surprisingly small mortality.

One hundred and one gastro-enterostomies by Mayo Robson show a mortality of 39 per cent and twenty cases of pyloroplasty, twenty recoveries. To quote from Mr Robson regarding the mortality of his cases of gastro-enterostomy "Death was due to the extremely low vitality at the time of operation."

In 168 cases of gastro-enterostomy performed by Mayo, 157 recovered and eleven died, a mortality of 6.5 per cent

Munro, of Boston, in personal conversation, stated his recent figures of gastro-enterostomy as twenty-five recoveries and two deaths, both deaths being due to disease foreign to the operation. These figures show that the operation in itself is not to be feared, and it is a general surgical belief that, if the cases could be subjected to operative treatment before the patient is practically starved to death by lack of intestinal absorption, the mortality would be even lower.

The surgical cases are so few in number and so concisely recorded that the salient points of each case are given below.

CASE I—Mayo Robson—Man, thirty-four years old, suffering five years with epigastric peristalsis giving the ordinary picture of pyloric obstruction. For some time before the operation he had "cramps" in his limbs, especially the legs. While in the hospital, just before operation, he had a severe attack of tetanic spasm described as follows: "affecting almost all the muscles of the body." "So extreme were these and so widespread, the muscles of the trunk and of the cervical region, as well as those of the limbs being affected, that the question of poisoning by strychnine was raised."

Operation seven days later, pyloroplasty. "The obstruction was found to be cicatricial stenosis with hypertrophy of the pylorus." The convalescence was uneventful. Mr Robson states that in a letter from the patient four years later, he expressed himself as a "new man," and had been without recurrence of the "cramps."

CASE II—Man, twenty-four years old. Mr Robson records the gastric condition and the symptoms of tetany as follows. The patient had "severe painful cramps of the extremities and abdomen with persistent vomiting." "He gave a history of having had pain after food for several years previously and to have vomited blood, since which time he had never been well and had gradually lost flesh." "For some little time before I saw him he had vomited every day unless the stomach was washed out."

*Operation—*Pyloroplasty. "The pyloric orifice would only permit the passage of a No. 10 catheter." *Diagnosis—*"Simple stricture of the pylorus." The recovery was uninterrupted. Mr Robson states that a letter received from the patient one year later stated that he had had no further trouble with his stomach.

CASE III—Mayo Robson—Woman, twenty-nine years old. This patient had suffered severe abdominal pain associated with vomiting and loss of weight for seven years. At the end of six years operation was advised and refused. No record of tetany appears up to this time. One year later the patient returned, and Mr Robson's record at that time is

quoted as follows "The pain in the abdomen was excruciating and occurred every day" "She said it was associated with severe cramps in the legs and thighs, and at night she was kept awake by the pain" "Vomiting of large quantities occurred daily and she was steadily losing weight and strength"

Operation—"Active ulceration of the pylorus, which was adherent to the gall-bladder, liver, and abdomen walls, and was so much thickened as to form a distinct tumor" "Pyloroplasty was performed after the adhesions had been separated" "Recovery was uneventful" A report sent to Mr Robson a little over three months after operation stated that "she had gained flesh and was well"

Seven months after operation the patient began to have stomach symptoms, but with little loss of flesh The record shows that, beginning two years after operation, "the vomiting and loss of flesh and well-marked stomach splash showed that the pyloric trouble had recurred, and, as I found a distinct tumor of the pylorus which I believed to be simple inflammatory induration, I performed a gastro-enterostomy"

A letter one year later states that the patient was well and had regained her weight There were no returns of the painful cramps from the time of the first operation

CASE IV—Fleiner—Lacks details of conditions found at time of operation, which was a gastro-enterostomy The patient showed no untoward symptoms for the first four hours, then became restless, and two hours later died with symptoms of collapse The autopsy showed round-cell sarcoma of the pylorus, excessive dilatation of the stomach, and extensive degeneration of the parenchyma of the heart, the kidneys, and the liver The gastro-enterostomy wound and the local operative conditions showed nothing that would have entered as a factor in the fatal result

CASE V—Fleiner—Operated in the Clinic of Czerny of Heidelberg On this case a pyloroplasty was done The condition found at the time of operation was a benign constriction of the pylorus and dilated stomach The pyloric stenosis was referable to a foregoing duodenal ulcer, which had healed, and from which there had resulted numerous adhesions between the pyloric region, the liver, and the gall-bladder, while between the appendix and the gall-bladder there was a separate set of adhesions which had probably resulted from appendicitis of many years before The adhesions about the pyloric end of the stomach were divided and pyloroplasty was performed

The patient died ten days later Autopsy showed Pneumonia, pleurisy, purulent peritonitis over the cardiac end of the stomach, and acute parenchymatous nephritis

CASE VI—Gumprecht—In this case the duration of the tetany was of long standing

Operation—Pyloric resection The pylorus was broadened and thickened, and gave evidence of stenosis from an old ulcer The lumen would

admit a lead-pencil, but the finger could not be introduced into it. The patient died in five days of general peritonitis.

CASE VII—This case, which has been beautifully reported by W. C. Carnegie Dickson and later operated upon by Mr. Caird, is one of the most brilliant of the recorded cases.

Man, forty-seven years old. Gastric disturbance for sixteen or seventeen years, during the latter part of which time he had had four or five attacks of tetany. The stomach was much enlarged, and had a considerable residual of old putrefying food. The attacks of tetany and observations while in the hospital are recorded with great care and minuteness, and the reader is referred to Mr. Dickson's own descriptions for details.

The patient was at times *in extremis*. He, however, gradually improved, and left the hospital three months later, relieved of his vomiting and tetany.

After three months his gastric symptoms began to return and he lost considerable weight. He returned to the hospital and Mr. Caird did a gastrojejunostomy. "The pylorus was found to be greatly narrowed and somewhat thickened and hypertrophied, and at its upper and posterior part there were firm, puckered, cicatricial adhesions to the surface of the gastro-hepatic omentum, while similar old peritonitic bands were also found between the lower and anterior aspects of the pylorus and the adjacent surfaces of the great omentum."

The recovery was uninterrupted, and at the time of Mr. Dickson's article in 1901, several months after the operation, the patient was perfectly well, eating and doing everything and enjoying life in every way.

Analysis of the Operated Cases—Without going into details, this series of eight operated cases shows three deaths, two of which were due to complications incident to any abdominal operation, and the third, collapse, attributed to the very low vitality of the patient at the time of operation.

In conclusion, the writer wishes to express his appreciation of the courtesies extended by Drs. C. F. Withington and E. W. Buckingham by placing the records of the case, while on their services, at his disposal.

The history of this case while on Dr. Withington's service has been recorded, with other forms of tetany, in a paper by Dr. Lawrence W. Strong.

A complete bibliography is not given in detail, as many of the references recorded include the remaining articles upon the subject of gastric tetany.

The most complete bibliographies are to be found under

the references of the following men Risien Russell, Trevelyan, Souttar McKendrick, and Halliburton and McKendrick

REFERENCES

- Albu Volkmann's Sammlung klin Vortrage, 1897-1900, p 1499
 Berlitzheimer Berlin klin Wochenschrift, 1897
 Blazicek und Landsteiner Wiener klin Wochenschrift, 1894
 Bouveret et Devic Rev de Med, Tom xi, 1892, pp 48, 97
 Brieger Microbes, Ptomaines et Maladies, French trans by MM Roussy et Winter, Paris, 1887
 Bunge Text-Book of Physiological and Pathological Chemistry, trans by Wooldridge, 1890
 Carnegie Dickson The Practitioner, Vol 1, 1903
 Cassaet et Ferre De la Toxicité du Suc Gastrique, Compt rend Soc de Biol, Paris, 1894, p 532
 Chvostek Ueber das Verhalten der Sensiblen Nerven, und der Horner-ven bei Tetanie, Zeit f klin Med, 1891, p 489
 Clifford Allbutt Article on Dilatation of the Stomach, Clifford Allbutt's System of Medicine, 1897, Vol iii, p 501
 Collier Lancet, June 6, 1891, p 1251
 Dickson The Practitioner, 1903, Vol lxx, p 44
 Erb Archiv f Physiol, Vol iv, p 271, v Ziemssen's Handbuch, Leipzig, Vogel, 1878, Archiv f Psychiat, 1874, Band iv, p 271, Electrotherapie, Aufl 2, 1886
 Ewald Neurol Centralbl, 1893, p 326, Verhandlungen vom XII Congresse f innere Med xii, p 298, Ueber Tetanic, Wien med Presse, 1893, p 858
 Fleiner Archiv f Verdauungskr, Berlin, 1895, Vol 1, p 243, and Munch med Woch, Vol 1, 1903, p 853
 Frankl-Hochwart Die Tetanie, Berlin, 1891, Nothnagel's Specielle Path u Therap, Band xi, 1897, p 81
 Germain-See Quoted by Albu and Trevelyan, loc cit (1) and (30)
 Gumprecht Centralbl f innere Med, 1897
 Halliburton and McKendrick British Medical Journal, June 29, 1901, p 1607
 Kussmaul Archiv f klin Med, 1869, Berlin klin Wochenschrift, 1872, No 37
 Loeb Deut Arch f klin Med, 1890
 Marten Lancet, Vol 1, 1897, p 74
 Moynihan Boston Medical and Surgical Journal, Vol cxlix, 1903, p 501
 Mayo Robson Lancet, November 26, 1898, p 1392, and March 24, 1900, p 834, Diseases of the Stomach, and their Surgical Treatment, by Robson and Moynihan Balliere, Tindall, and Cox, London, 1901
 ANNALS OF SURGERY, December, 1903, Vol xxxviii, p 792 (article by Murphy)
 Muller Charite Annalen, 1889, B xiii, p 309

- Mayo ANNALS OF SURGERY, July, 1903, Vol xxxviii, p 30
- Neumann Deutsche Klinik, 1869
- Riegal Diseases of the Stomach, English edition, p 163
- Risien Russell Article on Tetany, Clifford Allbutt's System of Medicine, 1897, Vol viii, p 48
- Strong Boston Medical and Surgical Journal, 1902, Vol clxxiv, pp 561, 591
- Souttar McKendrick Lancet, September 24, 1898, p 796
- Trousseau Clinical Medicine, trans by Bazire, New Sydenham Society, 1868, Vol 1, p 376
- Tresilian Lancet, July 6, 1901, p 21
- Trevelyan Lancet, September 24, 1898, p 791
- Von Jaksch Klin Beitrage zur Kenntniss der Tetanie, Zeit f klin Med, xvii
- Weiss Volkmann's Sammlung klin Vortrage, 1880, p 189

SPONTANEOUS GANGRENE OF THE HOLLOW VISCERA¹

A STUDY OF MESENTERIC OCCLUSION

BY ROSWELL PARK, M D ,
OF BUFFALO, N Y ,

Professor of Surgery in the Medical Department of the University of Buffalo

WHAT I have to say regarding the appearance of spontaneous gangrene of wide extent within the abdominal cavity, and involving especially the hollow viscera, may perhaps be illustrated by a brief report of two exceedingly instructive cases

In April of 1902 I went to Ithaca for the purpose of keeping an operative engagement, the patient being ready in the hospital at the time. Immediately on my arrival, I was asked by Dr Meany to see with him a patient who had been brought in early the same morning. He proved to be a mail-carrier, of about forty-five years, without antecedent history, who had worked until the afternoon of the previous day, and had then been taken suddenly sick with severe abdominal pain, so that he had to abandon his work. I mention his occupation to indicate that he had been apparently in excellent health up to the moment of his seizure. When brought to the hospital, some three hours before I saw him, he was almost collapsed, with a rigid abdomen, very much distended, vomiting frequently a material which was almost fecal, and which had a coffee-ground appearance, his pain, which had been agonizing, had subsided. Physical examination revealed nothing except meteorism. Abdominal section was advised, and performed some three hours later.

While taking the ether his heart apparently stopped, and he was revived with difficulty, and apparently only by means of intravenous saline infusion. Incision in the middle line gave

¹ Read at Boston, January 20, 1904, before the Middlesex South District Medical Society

escape to a quantity of most offensive blood-stained serous fluid, after which he again collapsed and almost died upon the table I was able to explore sufficiently, however, to determine that the entire small intestine from stomach to cæcum was gangrenous, and in places almost ready to slough, that the large intestine seemed involved in the same process, but to perhaps less extent, that every portion of the peritoneal cavity was infected, and that the parietal peritoneum seemed almost as much involved as the visceral layer. The interior of the abdomen presented a perfectly cadaveric appearance, while the odor was even more offensive.

The abdomen was closed, and the patient removed alive from the table, but died two or three hours later.

Another case of same general character was that of a young married woman, thirty-three years of age, who late in the afternoon of November 29, 1902, was taken acutely sick with pain in the upper part of the abdomen and with vomiting, the pain was excruciating, and with difficulty relieved by morphine, the vomiting continued. The following day she was sent to the Memorial Hospital, Niagara Falls, New York, where I saw her, with Drs Campbell and Chapin, early in the evening. At this time, less than thirty hours after the onset of the trouble, she was exquisitely tender, vomiting greenish mucus with a distinct fecal odor. The abdomen was very much distended, and there had been no passage of feces nor even of gas, the abdominal muscles were rigid, her pulse was rapid, her pain had subsided, her tongue was not furred, and she was able not only to chat, but to be humorous in her remarks.

As the case had been described to me over the telephone, I was quite ready to find it to be one of acute pancreatitis, but after examination I abandoned this idea.

The operation was performed at the Memorial Hospital the same evening. Incision was made in the middle line below the umbilicus, the outer tissues were already œdematous and the subperitoneal fat was necrotic, the peritoneum was black. On opening it foul-smelling fluid escaped, on lifting up the omentum every loop of intestine that could be exposed or brought into view was gangrenous, and appeared almost ready to tear, the posterior surface of the omentum was almost black and gangrenous. Everywhere so far as I could explore, the same condition ob-

tained, and the large intestine seemed involved as well as the small

This patient surprised me in that she lived longer than I would have supposed possible. For about forty-eight hours she was comfortable, chatted, and seemed to feel quite encouraged, then she was seized again with intense pain, which did not yield to morphine, and which could only be allayed by inhalations of chloroform. She died some nine hours later.

In neither of these cases was autopsy allowed, the nature of the lesion must then be, to some theoretical extent, conjectural. It will readily be understood how difficult it would have been in either of them to arrive at a perfect solution of the problem, owing to the fact that the parts involved were already in a putrefactive condition some time before the death of the individuals.

The two cases which I have briefly rehearsed are perhaps the most pronounced of their type of any that I have encountered in literature, and deserve to be put on record. They may serve also as a general introduction to the subject, which probably has not yet been exhausted. (*Vide* also Elliot, *ANNALS OF SURGERY*, January, 1895.)

Mesenteric occlusion was first described by Virchow in 1859, and by Kussmaul and Gerhardt in 1863. Occurring in the mesenteric circulation, the condition is harder to explain than in many other places. It must, however, be remembered that while the veins of the mesentery have no valves, the arteries like those in the brain are terminal, and collateral circulation is therefore not prompt nor complete. After tying the superior mesenteric artery the blood supply of the intestine is at once shut off. Faber believes that the very weight of the blood contained in the portal circulation may so obstruct the arterial supply as to lead to the formation of infarcts. Bier maintains that after obstruction a collateral circulation is not re-established because the intestine lacks that "Blutgefühl" upon which he lays so much stress, and because it seems to be under no complete vascular control.

The influence of the hæmorrhagic diathesis and the association of hæmorrhages in other parts of the body, especially in the submucous tissues, have been noticed in not a few cases. This has been considered to be an expression of a toxæmic condition, due perhaps to a lack of hydrochloric acid in the stomach, although it may include any one of the various toxins in the blood. Whether the first change which leads up to this result occurs in the blood or in the blood-vessels is still an open question. It will be remembered that Henoch described a form of purpura characterized by hæmorrhages into the joints as well as by bloody vomit and stools. It is of interest to note here, also, that one of the explanations given to purpura is that it is due to multiple emboli in the small vessels of the skin.

According to Gallavardin, the most frequent cause of mesenteric embolism is mitral stenosis, the next most frequent cause is probably arterial sclerosis. Falk collected seventeen cases of embolism of the intestinal arteries, in every one of these there was evidence of embolic disturbance elsewhere, which constitutes an important point in diagnosis. The possible simultaneous occurrence of embolism and thrombosis should not be overlooked. Sprengel has described a form of dry anæmic gangrene of the intestine, which, however, appears to involve relatively small areas instead of producing extensive destruction.

Thrombosis is nearly always an extension of a primary lesion beginning in the veins of the pelvis, kidney, or intestine. It is common after acute appendicitis, acute metrophlebitis, pyelophlebitis, intestinal ulceration, etc. Curiously, it is rare after that most extensive form of the latter with which we have to deal in typhoid fever. The veins are often affected in these cases, but much more often those of the lower extremities than those of the intestine. And here, by the way, I might add, we notice peculiarities varying apparently with different years, for instance, during the past summer and fall I saw more cases of crural phlebitis than in many previous years together. In the thrombosis which follows infection of the hæmorrhoidal

veins the type of the disease is usually pyæmic, and the most prominent lesions are in or around the liver

In the mesenteric veins there occurs a form of endophlebitis corresponding very closely to the endarteritis which produces arteriosclerosis, and which is scarcely ever met with elsewhere in the body. Nowhere else, save in the brain, are we likely to meet with multiple aneurisms and the trouble which they may set up

Presumably the trouble occurs in the arteries more often than in the veins, and consequently an arterial lesion may appear as (a) infarct, (b) gangrene, (c) abscess

Here, too, embolism may have different results than those which follow it elsewhere about the body, for example, in the brain it usually produces necrosis, as it does also in the extremities, whereas in the lungs it produces infarct, the result depending largely on the size of the vessels, the richness of the anastomosis, and the blood-pressure. In the mesentery so many factors figure that there must necessarily be many discrepancies between theory and fact. Cohnheim experimented by tying the artery and vein together, he also tied the artery alone, but found the results were practically identical. The readiness with which intestinal tissue breaks down when its blood supply is cut off has been especially demonstrated by Grawitz, who has shown how easily the necrosing intestinal walls become permeable for bacteria. Litten also experimented extensively with animals, and called attention to the remarkable depression of the pulse, complete loss of appetite, frequent vomiting of blood with bloody stools, and the meteorism, which follow the application of ligatures to these vessels

Tangle and Harley, as well as Kalisch, have found that glycosuria often follows experimental ligation, especially when the ligature is placed upon the upper mesenteric artery. Meteorism, which is so pronounced a feature of these cases, is explained by Kader as due to the complete paralysis which follows such acute gastro- and enteromalacia. All the experiments of the different investigators tend to show that obstruction to the circulation of the mesenteric artery is quickly fol-

lowed by necrosis and infarct. Why the coeliac branches of the gastrohepatic, pancreaticoduodenal, gastroduodenal, and the gastro-epiploic do not better bear the burden thus imposed upon them, it is hard to understand. Cohnheim believed that the vessels of the intestines, like those of the kidney, have very little power of resistance, and on the contrary break down very easily and rapidly. As already remarked, the intestinal veins have no valves, and therefore carry, unassisted, the pressure of the portal system.

While what I have said pertains largely to shutting off the blood supply of the entire intestinal tract, there are numerous recorded cases which show also that we may have involvement of some of the mesenteric branches rather than of the principal trunk, so that in some cases we get an annular necrosis of greater or less extent. When one in operating sees the intestine bleed as readily and freely as it usually does, he often fails to appreciate the fact that, in spite of the great vascularity of the parts, the anastomotic paths are long.

Several cases are on record of mesenteric occlusion following thrombosis in the pulmonary veins. Again embolism may be, and in fact must be, followed by a thrombosis in the occluded artery, as well as later in the accompanying vein. Trouble of this kind is relatively much more frequent among some of the lower animals, especially the horse, and occurring in these animals is usually due to the presence of *strongylus* in the intestinal vessels. Here it produces an endarteritis, this leads to the formation of the so-called "*aneurisma verminosum*," whence may proceed numerous emboli.

So soon as one of these vessels has become plugged there ensues a prompt contraction or anæmia of the gut, then follow venous stasis and loss of contractility. This may be evidenced by dilatation, so that at this time the appearance of the compromised intestine may vary from well-marked anæmia to positive gangrene. Such cases as those with which I began this paper indicate a process involving both the superior and inferior mesenteric vessels. The extent of the necrosis may also vary from a slight annular gangrene to such total gangrene

as that which I first described, even the colon, sigmoid, and rectum may suffer in some of these cases, while Harrington and others have described gangrene of the rectum, even including the anus and the sphincter, apparently resulting from similar lesions (*Boston Medical and Surgical Journal*, loc cit)

My own cases were characterized by a large amount of fluid and bloody exudate, by gangrene of the parietal peritoneum, and by œdema of the subserous tissues, showing an intensity and extent of damage far beyond that with which I had become familiar in my reading, and which seemed to me remarkable

The intestinal contents in these cases are frequently bloody, sometimes almost pure blood. It is stated that sometimes the lymph nodes do not seem to be implicated, the process having been apparently too rapid. Obviously, peritonitis will always complicate such a case, while the patient apparently dies of very acute toxæmia.

Mesenteric thrombosis by itself has been carefully written up, among others, by Pilliet (*Progres Médicale*, 1890), who thinks that not every case is fatal, in other words, that cases occur and are followed by recovery, and that it is often an ascending process. Mesenteric thrombosis is known to have followed amputation of the lower extremities for gangrene of the leg, and for gangrene of both feet. It probably more often follows an atheromatous process in the vein walls, such, for example, as may occur in connection with nephritis. Cases have been reported by Osler and by Chiene where the origin of the artery was involved in the wall of a small aneurism. That it may follow such lesions as intestinal ulceration, especially of the tubercular variety, intestinal cancer, splenic infarct, etc., is well known. On the other hand, there is no sufficient explanation for the fact that it so rarely follows typhoid fevers.

SYMPTOMS AND SIGNS

The more complete the occlusion of the mesenteric vessels *i e.*, the more extensive the area suddenly deprived of blood

supply, the more sudden and more overwhelming will be the symptoms. Of these the most significant are as follows

(1) *Sudden Onset*—In the most severe cases this can usually be recorded by the watch, since patients indicate nearly the exact moment at which they began to feel severe pain, while the other symptoms follow so quickly as to make it a sudden and overwhelming affection

(2) *Intensity and Character of Pain*—This is sometimes paroxysmal, at others continuous. It is nearly always severe and often agonizing, and scarcely to be quieted by an ordinary opiate. Sometimes it is spoken of as intense colic, even mild degrees of the lesion are often accompanied by sufficient pain to present a prompt and very grave indication. On the other hand, rare instances are known in which the disease has run its course almost without pain

(3) *Diarrhœa*—This is usually an early symptom, the evacuations being profuse, and bloody after a few hours if not at first. It is met with in from 30 to 40 per cent of cases

(4) *Obstructive Symptoms*—These are sometimes those of ileus, sometimes those of constipation, which may be followed by diarrhœa

(5) *Vomiting*—Usually occurring early, the vomit being bloody or even after a few hours fœcal

(6) *Rapid Pulse*, which will be rarely less than 110 and may run as high as 130 or 140

(7) *Subnormal Temperature*, which, though not constant, may be an occasional symptom

(8) *Meteorism*, which begins early and becomes very marked

(9) *Abdominal Rigidity*—This, with the previous symptoms, prevents palpation or the discovery of anything which may ordinarily be made out by the sense of touch. These two symptoms constitute a most distressing and at the same time a most indicative feature, and by themselves indicate the gravity of the situation, while affording little or no opportunity for relief

(10) Later and to the above may be added, perhaps, evi-

dence of the presence of fluid in the peritoneal cavity In connection with the symptoms stated above, this can only be regarded as adding to the gravity of the situation Yet a little later, although perhaps not much, will be added the features of complete collapse, delirium, etc., which precede death When the inferior mesenteric artery is involved, it is said that tenesmus becomes a rather prominent characteristic, since the colon and rectum are partly supplied from this vessel

When mesenteric thrombosis or embolism are suspected, one should carefully search over the rest of the body for similar lesions elsewhere, it would add to the certainty of the diagnosis should these be discovered Kussmaul stated that pain about the navel indicates a lesion of the superior mesenteric artery, while when referred rather to the sacrum it means involvement of the inferior vessel Litten believes that the so-called tea-ground stool indicates involvement of the upper vessel, while fresh blood in the stools is likely to come rather from the branches of the lower Of course, a distinction between occlusion of the artery and vein is most difficult to establish, and is practically impossible unless evidences of the embolic or thrombotic process be found elsewhere And even upon autopsy the deeper parts may be so softened and disintegrated that the ordinary post-mortem evidences of one or the other may be lacking

DIFFERENTIAL DIAGNOSIS

The principal conditions from which mesenteric thrombosis and embolism have to be distinguished may be catalogued as follows

(1) *Perforating Ulcer of the Stomach and Duodenum*—It has been estimated that from 6 to 25 per cent of gastric ulcers perforate A previous history which may be interpreted as an indication of gastric ulcer will be of very great help in diagnosis, if obtained It must be remembered that ulcers upon the anterior wall of the stomach give few, if any, symptoms in at least many cases, and that in at least 10 per cent of all cases no significant antecedent history is obtainable, even

from intelligent patients. Along with gastric ulcer may be also mentioned so-called *phlegmonous gastritis*, either general or localized, which in the latter form has also been described as *abscess of the stomach*. Of the former there are about fifty recorded cases.

The symptoms of perforating ulcer are sudden, stabbing, overwhelming pain, usually referred to the epigastrium, and perhaps radiating rather widely. Hæmatemesis occurs in perhaps 40 per cent of the cases, while collapse and vomiting are well-nigh invariable accompaniments. Thirst in these cases is usually urgent and distressing. The abdomen first becomes rigid, then distended, and finally actually bulges. Should a patient rally from these first symptoms, they will be followed promptly by the ordinary signs and symptoms of peritonitis.

(2) *Acute Obstruction*—This will include not only the ordinary varieties of strangulated hernia, but more especially perhaps the rare forms, such as diaphragmatic hernia, that through the foramen of Winslow, etc. It will include also the other forms of obstruction which may be produced suddenly, and more especially those conditions included usually under the terms intussusception, volvulus, and ileus, while the condition a few hours after onset may be essentially that first described. The onset itself is rarely so acute or sudden as in the mesenteric occlusion.

(3) *Pancreatitis*—This may very closely simulate mesenteric occlusion, in fact, the symptoms would be nearly identical, and the diagnosis of pancreatic disease would probably be made on the doctrine of the chances, if on no other ground. Whether of the hæmorrhagic or the necrotic type, there would be little or no difference in the symptoms. But even in pancreatic disease the onset is not likely to be quite so sudden.

(4) *Acute Splenic Infarct*—Acute necrosis of the spleen is known, and is usually due to sudden obstruction of the splenic vessels, corresponding to that of the mesenteric. Under these circumstances the spleen goes to pieces in very short time and the condition is practically always fatal. If it is to be distinguished from the other conditions already mentioned, it

will be largely by localization of pain, rigidity, and other features on the left side rather than in the central area of the abdomen. Should error arise, and this condition be detected instead of the other, it would be a less unpromising matter to remove the spleen than to attack an extensively necrosed bowel.

(5) *Acute Appendicitis*—This may occasionally present features which entitle it to be placed in this category. This is equally true of those very rare cases of inflammation involving Meckel's diverticulum. In fact, all fulminating gangrenous appendicitis reproduces, in miniature, the far more extensive condition to which this paper is especially devoted. This tiny annex to the intestinal tract is especially often met with completely dead and sloughing, and it may afford an illustration of what may happen to the entire bowel under similar but greatly exaggerated conditions. While it thus affords such an illustration, it is not often that between this condition and the greater one confusion will arise, but it is possible that, following gangrene of the appendix, there may be extensive necrosis of those portions of the bowel which come in contact with it, so that when the abdomen is open extensive areas of gangrene may be met with. Such was the case in an instance recorded by me in the first number of the *Archives Internationales de Chirurgie*, and which I would briefly epitomize as follows:

A young man, sick four days, was brought to my clinic, a distance of some sixty miles, suffering acutely with all the usual symptoms of obstruction of the bowel. On arrival he was nearly collapsed and in quite unpromising condition. A greater resistance upon the right side of the abdomen than upon the left, accompanied by what I can only describe as an almost "doughy" feeling under the finger, led me to open in the right semilunar line. The condition revealed by the incision was in brief this: there had been acute gangrenous appendicitis, and in consequence thereof all the adjoining convolutions or loops of small intestine had adhered together, thus walling off the scene of gangrenous activity, while their exposed surfaces had themselves become infected and were now necrotic. The cæcum itself was also gan

grenous It was now a question either of multiple resection, which was quite out of the question when the patient's condition was considered, or of total resection of a great length of the affected bowel The latter seemed the quicker procedure, while both of them seemed equally hopeless Several inches of the cæcum and ascending colon were then removed, with the lower portion of the small intestine, the bowel being divided just above the uppermost gangrenous area, all the intervening portion being completely removed The upper end of the colon was completely closed as well as the lower end of the small bowel, and an anastomosis made with the Murphy button The entire length of intestine thus removed was 265 centimetres (eight feet nine inches) To my astonishment, the patient recovered There was fæcal fistula for some weeks, which gradually diminished and finally closed, and the button was not passed for nearly three months, but the patient is to-day well and active, and apparently in nowise the sufferer because of loss of half of his bowel

I mention this case because I think it fits in very properly and lends an illustration of possible hope in a class of cases which, save for some such procedure, would be positively hopeless I assembled from literature sixteen other cases besides my own, where over 200 centimetres of the bowel had been resected Of the seventeen, fourteen recovered It is singular that where from 100 to 200 centimetres have been removed nearly 30 per cent of cases have proven fatal

This condition is worth alluding to again because it may happen, as in my case, that when one has opened the distended abdomen the first picture presented to his eye is one of widespread gangrene, for whose cause he must necessarily next seek in order that he may determine what next to do

(6) *Acute Cholecystitis*—This, which may prove a fulminating process can usually be differentiated by a history of previous disease or gall-stone colic, and by the location of the tenderness and pain and the presence of a localized swelling When present in its most acute form, it may lead to rapid necrosis The gall-bladder dies sometimes as does the appendix

(7) *Ruptured Extra-uterine Pregnancy*—Within a little over a year it has happened to me to have three cases sent to my clinic for operation for appendicitis which proved to be ruptured extra-uterine pregnancy, and in one of these the widespread character of the pain, the alarming degree of collapse, and the abdominal rigidity which promptly followed, brought about a condition of affairs which, at first, at least led to speculation and error in diagnosis. Doubt of this kind can usually be settled by obtaining a significant menstrual and pelvic history, but if, as in one of my cases, the patient is too collapsed to give any history, or in another too stupid to make her statements reliable, it will be seen that doubt will exist until the abdomen is opened.

(8) *Intrathoracic Lesions*—To your surprise, perhaps, I shall have to include here, among other conditions from which mesenteric thrombosis must be differentiated, certain intrathoracic conditions which may be very misleading and at the same time very serious. For instance, I have been more than once called to operate for acute appendicitis because of reference by the patient of his severe pain to the lower part of the abdomen, when a careful physical examination revealed a rapidly developing pneumonia, and I have seen this when the pneumonia was on the left side. My own experience in this matter coincides with that at least of some of my surgical friends with whom I have compared notes on the subject.

I may even mention one case of extreme interest which I saw with my colleague, Dr. Stockton, whose name is a guarantee of the carefulness with which the case was observed. The patient, an electrician, was taken late in the evening with an intense pain referred to the upper and left portion of the abdominal cavity. In addition to his pain, muscle spasm of that side became a prominent feature. There was a certain amount of nausea and vomiting, and everything pointed at first to an acute lesion somewhere in the upper abdomen, while the somewhat abnormal respiratory sounds made it seem possible that it might be a question even of strangulated diaphragmatic hernia. At the end of twenty-four

hours operation was advised, but temporarily declined by the patient, being delayed at least until the following morning in order to secure the presence of certain relatives. When morning came the case showed unmistakable evidences of pneumonic consolidation, and the next day not only revealed it as a case of well-marked pneumonia, but this was later followed by rapid and extensive empyema which required operation, and following which he eventually recovered.

I think it is well worth while to place such a case upon record because of its extreme instructiveness regarding an extremely complicated and difficult condition.

While this is not a comprehensive list, and while almost any unquestionably serious condition within the abdomen may lead to error in diagnosis, it nevertheless comprises the principal conditions from which we must endeavor to differentiate the truly and originally gangrenous lesions. Nevertheless, while in no way making light of diagnosis and while encouraging any and every attempt to perfect it, the fact remains that every one of these abdominal conditions mentioned calls for prompt surgical intervention, and, rather than waste hours of most valuable time in futile attempts at diagnosis, I would prefer to content myself with a recognition of the gravity of the existing lesion, of the uselessness of drugs, and of the urgent need for instant exploration. In these cases, perhaps more than in any others, the paramount indications for operation are all present, the intense pain, the collapse, the abdominal rigidity, which surely can be recognized within the hour when they occur, and which of themselves call for operation, without of necessity waiting for corroborative indications of vomiting of blood, meteorism, or other symptoms.

The only recorded case known to me of mesenteric occlusion not proving fatal is that reported by Chiene (*Edinburgh Journal of Anatomy and Physiology*, 1868, III, 65) as met with in the dissecting-room. Here the branches of the celiac and mesenteric arteries were found filled with the injecting material, while their main trunks were completely occluded by

an old embolic process. The cœliac axis was changed into an old fibrous cord and both mesenteric arteries were obliterated. The blood evidently reached the mesenteric arteries through the left and middle colic vessels, while the extraperitoneal vessels served for communication with the internal iliacs.

We must, however, be perfectly fair to the subject, and acknowledge that even an early exploration in the cases such as I began with would be of no avail. These are, however, extreme cases, from which valuable lessons in pathology may be drawn, though no lessons pertaining to operative surgery. While these cases, then, were extreme in their type, there are nevertheless other serious cases where the gangrenous process is not so extensive, and where resection of intestine might be of possible avail, as in the case which I have above reported. There are moreover a sufficient number of cases of lesser degree of gangrene where operation has been of great service, and no better illustration of this can be afforded than instances reported by Boston surgeons like Elliot, Mixter, and others.

Surely this is no place to go into the technique of operations of this character, every such case must be a law unto itself. Among other things that the surgeon will have to decide, and promptly, will be the question of drainage, posterior as well as anterior, of irrigation, character of sutures, etc. But any man who is competent to deal with such a case may well be trusted to adapt his measures to his own case and its environment.

In conclusion, I would like to make a general statement, and emphasize it, to this effect. That in the presence of sudden and acute symptoms, which include intense abdominal pain, collapse, and rigidity of abdominal walls, very little time should be wasted in speculation as to the character of the lesion. This triad of symptoms constitutes a reliable and exacting demand for abdominal section, followed by such suitable measures as the case may call for or permit. No such case as would be lost without an operation would be lost in consequence of it, while every such case must, without it, of necessity prove fatal. Of these cases, as of most others in the hands of competent men,

it should be said that they *die in spite of operation, not because of it* !

* The following papers may be advantageously consulted in this connection

Talke Ueber Embolie und Thrombose der Mesenterialgefasse, Beitrage zur klin Chir, Band xxxviii, S 743

Neuha Ueber die Erkrankungen der Mesenterialgefasse, etc, Centralblt f Grenzgebiete, Band v, S 705 *et seq*

CHRONIC EMPYEMA OF THE GALL-BLADDER

REPORT OF A CASE OF THIRTEEN OR MORE YEARS' DURATION

BY ERNEST J MELLISH, M D ,

OF EL PASO, TEXAS,

Surgeon to Hôtel Dieu Hospital

MRS L , aged forty-three years, married at twenty-three, mother of ten children, family history negative Had typhoid fever at the age of eleven, otherwise always well until nineteen years ago, at the time of her first puerperium, when she had what was called peritonitis She had at the same time a sense of discomfort, with heat and "stinging" in the right side of the abdomen At subsequent puerperiums she was troubled more or less in the same way About six years after the first attack she had a second one of "peritonitis " It was at this time she first noticed a swelling about the size of an orange in the right hypochondro-lumbar region This tumor was readily movable, and she does not recall that it was especially sensitive to pressure or caused any great amount of discomfort, beyond a sense of weight and dragging She does not give a history of having had any definite attacks of biliary colic or other evidences of gall-stones, excepting that she thinks she has been somewhat jaundiced at times

When examined in the summer of 1902, there was found a tumor about the size of a small foetal head, evenly globular, and movable from the right iliac region to the region of the right kidney It was not tender to pressure and it seemed a solid mass She complained only of a dragging sensation in the right side, which was very exhausting, and some of the ordinary symptoms which accompany retroversion and metritis, both of which ailments she had Operation was advised on the presumption that some pathologic condition of the kidney was present Save for the conditions described above, the patient was in as good health as ever At the time of entering the hospital, April 4, 1903, she was in practically the same condition as at the first examination

Operation—April 6, with the assistance of my associate, Dr Adrian B Perkey Ether anæsthesia Vertical incision about

twelve centimetres long at the outer border of the right rectus muscle, subsequently joining this with a lateral incision about six centimetres long. The tumor presented as a smooth globular body, non-adherent to the viscera, and apparently retroperitoneal. On its anterior surface was a placenta-like mass which looked much like a clot of blood beneath the peritoneum. Its superficial area was seven by ten centimetres and it was five centimetres thick. This mass was continuous at its upper end with a ridge of tissue which apparently contained the chief blood supply of the tumor, which was now found to be cystic in character. Aside from the placenta-like mass the cyst was of a light pinkish hue. The outer coat of the cyst was incised around the red mass, excepting at its upper part, and an attempt made to enucleate without rupturing the cyst, but after getting it about two-thirds enucleated a small rent was made letting out some thick, whitish yellow pus. As the peritoneum was well protected with gauze, this escape of pus gave us very little concern. Moreover, pus long confined usually becomes sterile, or nearly so. The pedicle of the cyst was in the shape of a very extensive ridge of tissue which seemed to come from the retroperitoneal tissue and the inferior surface of the liver. After having raised the cyst from its bed, we found that the red mass on its anterior surface was continuous with a sickle-shaped extension of the right lobe of the liver. This was ligated off close to the cyst. Search was made for the gall-bladder, but none could be found in the usual situation. The right kidney was found high in its fossa. Counter-opening was made near the border of the quadratus lumborum muscle, a gauze drain drawn through from within outward, and the abdominal wound sutured in layers. The patient made an uneventful recovery, without the occurrence of suppuration, and was curetted and operated for the retroversion about three weeks later. She is now (January, 1904) enjoying better health than she has had before for nearly twenty years.

During this operation we were ignorant of the nature of this cyst, although the possibility of its being a gall-bladder was mentioned, and its identity was not discovered until after completion of the operation, when it was opened and found to contain two gall-stones. The examination of the specimen removed was made by Dr A. B. Perkey.

The pedicle of the cyst contained, of course, the remains of

the cystic duct, but the duct tissue was indistinguishable from other connective tissue of the pedicle. The placenta-like mass before mentioned was normal liver tissue, as shown by the microscope. The cyst measured thirty-five centimetres in circumference in its short diameter and forty-five centimetres in its long diameter. Its wall, aside from the part composed of liver tissue, was from three to five millimetres thick and almost completely calcareous. The lining membrane was rough and calcareous, like a calcareous aorta. Microscopic examination of the fresh pus showed a few cells, crystals of cholesterol, and fat globules. The stained pus showed mostly degenerate cells, no bacteria. Cultures on blood serum, two tubes, showed small, white, pin-point elevated growths, two on one and four on the other. Smears from these tubes gave diplococci—single and in chains—which were destained by Gram's method. The presence of these bacteria may have been due to accidental contamination. The gall-stones are of about equal size, one and a half centimetres in diameter, and present numerous facets, showing that they have been in contact with many stones. This hypothesis is in a measure borne out by the finding of much cholesterol in the pus contained in the cyst, although a certain amount of cholesterol may be found in pus anywhere. These stones have a specific gravity less than that of water and are composed mostly of cholesterol. As to the sickle-shaped process from the right lobe of the liver, there can be little doubt that it was caused by the constant dragging of the heavy gall-bladder upon its attachments.

A fair idea of the appearance of the anterior aspect of the cyst may be gained by reference to the accompanying cut (Fig 1), made from a free-hand drawing, which represents about two-thirds natural size.



Gall bladder, chronic empyema The dark area represents liver tissue, the upper termination showing the point of severance from the pedicle (Drawn by Dr Perkey)

TRAUMATIC PYELOPARANEPHRIC CYST.¹

BY BERN B GALLAUDET, M D ,

OF NEW YORK,

Surgeon to Bellevue Hospital, Demonstrator of Anatomy, Columbia University

THE facts of the case are as follows The patient is a male, fifteen years of age, and was always perfectly well and sound up to his twelfth year, except for an attack of scarlet fever when very young Parents perfectly healthy Some time during his twelfth year, while shovelling snow, he was struck in the abdomen by the handle of the shovel, which necessitated confinement to bed for several days After that time and until two weeks before admission to hospital, March 28, 1902, his health was good, except for a more or less continuous pain in the right side of abdomen

Two weeks previous to admission, while attempting to jump on to a shed, the patient fell, his abdomen striking with considerable force on the edge of the roof of the shed His condition required carrying home and going to bed, where he remained four or five days with nausea and vomiting during the first forty-eight hours, and with blood in his urine The hæmaturia disappeared on the third day After five days, the patient could get around the house, but abdominal pain persisted

On date of admission, abdominal pain was intense, urine analysis was negative, general condition poor, and a small swelling was noticed in the right side of the abdomen on a level with the umbilicus This swelling was dull on percussion, no record of further examination of this swelling, nor of temperature, was obtainable

With hot local applications, etc, the condition became better until about the middle of April, when pain became intense, accompanied by abdominal distention

An incision was then made over and down to the swelling, followed by incision into the same, which evacuated over a quart of bloody fluid containing several large blood-clots, while partial

¹ Read before the New York Surgical Society, December 23, 1903

examination of the wall of the swelling showed it to be very thick and extending inward towards the kidney. A general diagnosis of cyst was therefore clear. The edges of the sac were then sutured to the edges of the abdominal incision and a tube inserted. The bloody fluid, according to pathologist's report, contained "no urine."

From that time until just before I first saw the case in September, 1902, the patient's general condition improved, and the wound and cyst cavity contracted until a regular sinus was formed. The sinus formation was complete in about six weeks after the incision, and remained stationary from then until September, in spite of local stimulating injections. During this period urine flowed freely from the sinus, and repeated examinations were negative except for the presence of a fairly large number of leucocytes. Drainage tube had been removed permanently since the middle of July.

From about August 15 until October 1, however, there developed a series of "attacks," three or four in number, each attack consisting of high temperature (104° to 105° F), some delirium, pain and tenderness in and around the sinus, but no swelling, and cessation of flow of urine from the sinus.

Each attack lasted about two days and yielded readily to cathartics and introduction of a drainage tube and irrigation, when the flow of urine would be resumed.

On recovery, patient's general condition was a little worse each time. It was therefore decided to explore the sinus with the idea of removing the cyst wall.

The operation was performed October 3.

A word more as to the urine. During an "attack," as just stated, no urine came through the sinus, but the urine from the bladder was uninfluenced thereby, both in quality and quantity, the latter having become almost as much as if both kidneys were normal. The amount of urine from the sinus between "attacks" was a little less than normal each day. This precluded any necessity for finding out the condition of the other kidney should nephrectomy of the kidney on the side of the sinus be decided upon.

The operation proved to be difficult and tedious. A careful dissection (1) showed that the sinus ran into a large cavity, and (2) isolated enough of the cyst-wall of the latter for an accurate

diagnosis of the actual conditions, accompanied as it was by a wide opening up of the orifice of the sinus

The conditions found are indicated in the title. Thus the cyst-wall, thick and dense connective tissue, was closely adherent to the surrounding paranephric tissue, beginning right at the orifice of the sinus, the partial isolating just referred to being followed constantly by profuse venous hæmorrhage. Following this wall in towards the kidney, the inner surface was also exposed and found to be covered by flabby granulations. These were scraped off, and then it was plain, by looking into the cavity, that the cyst-wall extended to and into the renal sinus. In other words, there was direct continuity of tissue between the paranephric-tissue part of the cyst-wall and the renal-pelvic portion thereof. Therefore there was a tear in the wall of the pelvis, and with each edge of the tear was connected a corresponding part of the paranephric cyst-wall. There was also considerable dilatation of the pelvis as a whole.

Hence, the cyst-wall was partly pelvis and partly thick condensed paranephric tissue, thus justifying the title, pyeloparanephric cyst.

Further confirmation was obtained by observing and probing two infundibula whose orifices opened proximally into the cyst cavity, and also by finding the opening of the ureter from within the cyst. A probe was passed into the ureter, but could go no farther than two or three inches, owing to thick granulation tissue in the lumen of the tube. Although tough, the cyst-wall was fairly elastic and was probably stretched by accumulation of urine during the attacks previously mentioned. There were also found a few ridges running in all directions around the inner surface of the cyst-wall, which might have caused the obstruction to the outflow of urine also mentioned as one of the phenomena of the "attacks." At all events, no other cause for this obstruction could be found.

These conditions, although serious, did not seem in themselves bad enough to account for the high temperature and delirium occurring in the "attacks," because the thickness of the cyst-wall was apparently sufficient to prevent any absorption of toxins or micro-organisms. This being so, one naturally would think of the kidney as causing these symptoms as the site of either a nephritis (with bacteria and bacterial toxins) or a condition in

which toxins (non-bacterial) were being elaborated by faulty metabolism of the kidney-cells, the general condition then being an auto-intoxication rather than a septicæmia (or toxæmia) as it would be if the local condition were a nephritis

The kidney was therefore partially exposed, and one or two small but deep incisions into it were followed only by blood. As no pus was found in the cavity of the cyst, this showed the probability of the nephritis being in the form of small foci of pus, since it seemed that the nephritis must be suppurative because of the severity of the general symptoms. The kidney could be palpated and was soft and large. Realizing that if small foci of pus were present, the other kidney might also be similarly affected, it was nevertheless felt that nephrectomy should be done, because of the progressive impairment of the patient's general health, and because the other kidney had shown absolutely no signs of any trouble at all.

Nephrectomy was accordingly performed. Many adhesions were found and much hæmorrhage occurred. An attempt was made to take out the entire cyst-wall with the kidney, but was abandoned, owing to adhesions and loss of blood. Therefore, the kidney, being now free, was removed, together with its adrenal body, the cyst-wall being cut right across at about its connection with the pelvic wall. Some two inches or so of the ureter below and outside of the cyst-wall were exposed and removed. There was now left in the wound only a good bit of the adherent original cyst-wall. The piece of ureter removed showed granulation tissue throughout, and the kidney on being split showed multiple pus foci, but almost of microscopic size. The pathologist confirmed the diagnosis, and also excluded tuberculosis both renal and ureteral. Any share in the cyst formation on the part of the kidney or adrenal body was also positively excluded. Most of the wound was sutured, a drain of gauze being inserted where cyst-wall was left.

Uneventful recovery except for wound. Thus, some six or eight weeks after operation the patient was in perfect health and had gained ten or twelve pounds. Locally, however, the wound had become a sinus with the usual small amount of seropurulent discharge. It showed no signs of healing in spite of the usual stimulating injections. A week later a piece of silk ligature came away. Still no advance for another week. Ether was then given

and the sinus was laid open freely, and, as suspected, the remains of the cyst-wall were found just as large and tough as at the end of the first operation. Although hæmorrhage was profuse, there was no reason (the patient being in good condition) for stopping the operation and leaving any of the cyst-wall behind, so it was all dissected off and the wound partially sutured and partially packed with gauze. The patient was out of bed in three days, and the wound solidly healed at the end of two or three weeks.

Of course, the interesting and probably unusual aspect of this cyst is not that it was chiefly paranephric,—since paranephric cysts are fairly common,—but that the paranephric part was so closely connected with the renal pelvis that there was not only a cavity in common, but also a continuous cyst-wall, first of paranephric tissue and then of the pelvic wall. Just how unusual this condition may be I have been unable to find out, but that it is certainly uncommon may be inferred from as much of the literature as I have been able to look up (See Bibliography at end of article). The cause of the cyst, judging from the history and the findings, was undoubtedly traumatism, discussed more fully in later paragraphs. The research into the literature,—for most of which I wish to express my thanks to Dr J F McCarthy of this city,—while not exhaustive, was thorough, and resulted in finding mention of many pathologic renal cysts, of a few traumatic renal or traumatic paranephric cysts, but no mention at all of pyeloparanephric cysts, either pathologic or traumatic.

An attempt will now be made to assign the cyst to its proper place among cysts in general and cysts of the “kidney region.” Hence a short review is necessary of *cysts in general* and “renal cysts” (the last expression being used generically to express all cysts in the “kidney region,” that is, cysts of the kidney, of the adrenal body, of the pelvis of the kidney, and of the paranephric tissue).

Beginning with *cysts in general*, there are three main classes. (A) Truly neoplastic cysts, that is, cysts which are really neoplasms, often called *cystomata*, (B) Parasitic cysts,

and (C) Cysts which are neither neoplastic nor parasitic This classification, of course, also applies to cysts in the "kidney region"

(A) *Cystomata* or *Neoplastic Cysts* —These are being considered more and more in connection with true solid neoplasms, with which they have far more in common both structurally and in etiology, than they have with "cysts" The structure of their walls, including that of the lining, is often quite complicated, so much so that the walls alone of a cystoma are almost, if not quite, identical with the structure of a solid neoplasm, thus differing entirely from the simple fibrous membrane of ordinary cysts or of the cyst which is the subject of this paper, while their contents is usually found to be made up of cell-elements mixed in with fluid or semi-solid tissue, very different from "serum" or "blood" of ordinary cysts Many cystomata are also multilocular

Coming to the "kidney region," the cystomata are exceedingly complicated, and their origin is only in the kidney or adrenal body, or both This origin from the cells of the Wolffian body and other embryonic structures and from inclusions of "adrenal rests" shows their complicated nature We may therefore safely exclude our cyst from the category of cystomata, especially of the kidney or adrenal body, if for no other reason than because no such findings resulted from the removal and examination of these structures

(B) *Parasitic Cysts* —This class needs only to be mentioned to be excluded from consideration Even in the "kidney region," the kidney "adrenal" and ureter are out of the question, as the result of the operation shows There remains the paranephric tissue, in which there may develop parasitic cysts, but the cyst under description is certainly not of that kind

(C) *Cysts which are neither Neoplastic nor Parasitic* —There are many varieties described, the chief difference between them seeming to be in many cases etiological rather than structural The subdivisions generally accepted are (1) Glandular retention cysts, (2) Cysts in pre-existing spaces other than

the alveoli of glands, and (3) Cysts of new formation occurring where there are no pre-existing spaces

(1) Glandular retention cysts From the nature and history of the case, these cysts may be excluded, especially those of the kidney and "adrenal," nor could the cyst have had its origin as a "retention cyst" of one of the minute glands in the wall of the pelvis There are manifestly no glandular "retention cysts" of the paranephric tissue, that is primary ones

(2) Cysts in "pre-existing spaces other than alveoli of glands" Among these are distended bursæ, ganglia (of tendon sheaths), hydrocele, and hæmatocele, all comprising the "transudation cysts" of some authors There should be added dilated lymphatics (often called simple serous cysts or hygromata), and dilated blood-vessels or "blood-cysts" The last named must not be confounded with either hæmatoma (a cyst of new formation) or angioma (a neoplasm) Nor must the serous cysts be confounded with lymphatoma (a cyst of new formation) or lymphangiectasis (a neoplasm)

Referring to the "kidney region," and excluding "kidney" and "adrenal," there are the renal pelvis and the paranephric tissue, which may be the sites of these cysts

Taking, first, the renal pelvis The "pre-existing space other than alveoli of glands" would be the cavity itself of the pelvis A cyst developing here might grow without involving kidney or ureter, or it might remain stationary, or it might involve the kidney or ureter, or its contents might break through the pelvic wall Comparison with the cyst under discussion shows that a portion of it, *i e*, the part whose wall is renal pelvis, is identical with these cysts, or, in other words, is a cyst occurring in a "pre-existing space other than alveoli of glands"

Regarding, in the next place, the paranephric tissue Part of the cyst occurred in this tissue If it developed in a "pre-existing space other than alveoli of glands," the "space" would have to be the lumen of blood- or lymphatic vessels which are in the paranephric tissue Against this possibility, however, are several objections First these "lymphatic or blood cysts"

are rarely, if ever, found in a region subjected to such a severe traumatism as we know was inflicted on the patient. Secondly, these "lymphatic or blood cysts" are so slow in growth and possessed comparatively speaking of such a delicate wall that communication with the cavity of the renal pelvis through its tough fibrous wall could not be established traumatically without a traumatism so severe as to destroy the delicate cyst wall entirely. Furthermore, this statement includes an assumption of the existence of the cyst prior to the traumatism, of which there is absolutely no evidence. Again, the cyst wall found was anything but "delicate," in fact, was as tough as the renal pelvis itself.

(3) Cysts of new formation, or those occurring where there are no pre-existing spaces. Among these are hæmatoma, lymphatoma, a "cyst wall" of thickened tissue enclosing a foreign body, and "cysts of degeneration." All these cysts have a fairly thick capsule and one which is more or less distinct from the surrounding tissue. The contents is usually "serum," and, if of long standing, it is often impossible to tell whether a cyst, with "serum" as contents, was originally a lymphatoma or a hæmatoma. "Cysts of degeneration" may be found in tendons as a variety of "ganglia" (distinct from that in tendon-sheaths already mentioned), or as a direct sequela to a "productive inflammation," in which case they are often multiple and small ("cystic degeneration" of some authors), they also occur in the tissue of some solid neoplasms.

In the "kidney region" Cysts of new formation in the kidney and "adrenal" may be absolutely excluded. In the pelvic wall have been recorded small cysts occurring from traumatism and containing blood, also cysts of degeneration. These may also be excluded.

In the *paranephric tissue*, on the other hand, "cysts of new formation" are fairly common as the result of severe traumatism, and may be lymphatomata, but are usually hæmatomata. When we consider the structure of such cysts and compare it with that of the cyst under consideration, it would seem

certain that the latter, that is the larger part of it, is a 'cyst of new formation' in the paranephric tissue

Having now placed our cyst, with, as we know, its close relation to traumatism, in *two* subdivisions of cysts "which are neither neoplastic nor parasitic," a probably correct explanation of its method of formation may be had from a consideration of the etiology and method of formation of these cysts

In the etiology of "cysts occurring in pre-existing spaces other than alveoli of glands" and of "cysts of new formation," traumatism is the most important factor, either as a predisposing cause or as a direct or exciting cause. This statement, though apparently simple, may lead to misapprehension, hence the following explanation. Cysts of these two subdivisions, when due to traumatism, are either recent or not. If *recent*, the contents (blood, serum, or traumatic oedema) is *directly caused* by the traumatism, but the capsule, as such, has not yet formed, and the "limiting wall" is simply the wall of the "space" (stretched or torn as the case may be) or the surrounding tissue (if no "space" exists). In this stage the cyst is not complete, *i e*, it has no capsule of its own.

If the cyst is not recent, its own capsule has had time to form, the formation consisting of a thickening of the tissue immediately around the contents and a differentiation, more or less complete, of the same from the more remotely surrounding tissue, all this is especially well marked in "cysts of new formation." This thickening, due to irritation from the presence of the contents, is regarded by some pathologists as a "productive inflammation," but by others as a form of degeneration, *e g*, a "fibrosis." Furthermore, the contents also is apt to undergo changes, especially if blood (absorption of coloring matter, deposit of fibrin, etc.) Hence the traumatism, in these "complete" cysts, is predisposing the exciting cause being the fluid first produced.

Referring now to the case described, and comparing with what we know of it that which has just been outlined, we may assume that (*a*) the first traumatism ruptured the pelvis of the kidney and also caused a hæmatoma both within the pelvic

cavity and in the paranephric tissue, (*b*) as time went on the blood was gradually absorbed, and the thickened capsule (extrapelvic portion) of connective tissue was formed (as just described) from the paranephric tissue, (*c*) the opening into the pelvis, however, remained, but the capsule (extrapelvic portion) was strong enough to hold any urine that might come through and prevent its extravasation, and (*d*) the second traumatism caused a fresh hæmatoma, partly by tearing the inner surface of the capsule as indicated by the ridges referred to in the history, and partly by causing small lacerations of the kidney

Hence, as already stated in making the individual comparisons, we may repeat (1) that the cyst, or rather cyst wall, having two parts, the one (pelvic portion) corresponds to that of cysts occurring in "pre-existing spaces other than alveoli of glands" and the other (extrapelvic portion) corresponds to that of "cysts of new formation," (2) that, as regards the cyst as a whole, both portions make a common capsule enclosing a common cavity, and (3) that traumatism was the predisposing cause

BIBLIOGRAPHY

A summary of what was found is given in the article, from which it is seen that nothing really bearing on the case is recorded

- American Gynæcological and Obstetrical Journal, New York, Polk
 American Journal of Dermatology and Urinary Diseases, McGannon,
 1899
 American Medical Compend, Toledo, Fox, 1903
 American Therapeutist, New York, McMunty, 1897
 Annals of Gynæcology and Pediatrics, Goelet, September, 1903
 ANNALS OF SURGERY, Philadelphia, Beck, 1901
 Aerztliche sachverständigen Zeitung, Berlin, Kuhn, 1901
 Bibliograph de Med, Paris, Eichler, Aug 1901
 Brooklyn Medical Journal, Goodrich, 1898
 Brooklyn Medical Journal, McNaughton, 1899
 Bulletin de Soc Anat, Paris, Tuffier et Durmont, 1898 [lxxii]
 Bulletin de Soc Anat, Paris, Delectre et Haret, 1900
 Bulletin de Soc de Chir, Paris, Walther, 1902
 Bulletin de Soc de Med, Paris, Menetier et Aubertin, 1902
 Centralblatt für allgemeine Path u path Anat, Jena, Stieda, 1901
 Clinical Journal, London, Tubley, 1901

- Gazet d Hosp , Milan , Ramovino, 1900
 Glasgow Medical Journal , Dalziel, 1902
 Glasgow Medical Journal , Newman, 1902
 Journal of the American Medical Association , Kelly, 1903 [v1]
 Journal Méd Soc de Lisle, Debuchy, 1898 [11]
 Lancet, London, Dickinson, 1900 [No 2]
 Lancet, London, Gallins, 1902 [No 1]
 Medical Chronicles, Manchester, Rea, 1903 [v]
 Medical Press and Circular , London, Maunsell, Jan , 1903
 Medical Times, 1900
 Medizin Wochenschrift, Munich, 1903
 National Medical Review , Stone, 1898
 Pacific Medical Journal , San Francisco, McNutt, 1899
 Plexus, Chicago, Davison, May, 1903
 Proceedings New York Pathological Society , Hodenpyl, 1901
 Reference Hand-Book of Medical Sciences, McWilliams [Vol v]
 St Bartholomew's Hospital Reports, London, Forbes, 1897
 South African Medical Journal , Cape Town, Watkins, 1898 [v1]
 Transactions Rhode Island Medical Society , Munro, 1902 [v1]
 Western Medical Review , Lincoln (Neb) , Conwell, 1903

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, Wednesday, December 9, 1903

The President, HOWARD LILIENTHAL, M D, in the Chair

INTESTINAL OBSTRUCTION FOLLOWING APPENDICITIS

DR LUCIUS W HOTCHKISS presented a man, fifty-four years old, who was admitted to the J Hood Wright Hospital October 23, 1903, with the usual signs of an acute, progressing appendicitis. His past history was negative, with the exception of the fact that he had been addicted to the rather free use of alcoholic stimulants. Three days prior to his admission he began to suffer from an acute pain in the right iliac region, which gradually increased in severity. He had vomited a number of times and had been unable to retain any nourishment. Upon admission, his temperature was 102° F, pulse, 120, respirations, 32. Four hours after his arrival at the hospital he was placed on the operating table. Under gas and ether anæsthesia an incision was made to the outer side of McBurney's point, through which a small amount of sero-sanguineous fluid and about half an ounce of thick pus escaped. The appendix, which was about five inches long and bound down by numerous adhesions, was freed and excised in the usual way, and the stump invaginated. After washing out the wound with peroxide of hydrogen and salt solution, a cigarette drain was inserted and the wound closed in layers about the drain. Upon examination, the proximal end of the appendix was found to be gangrenous, while its distal half was considerably inflamed. It contained a blood-clot and pus.

The patient had taken the ether badly, and became very noisy and troublesome at the completion of the operation. He devel-

oped a delirium which lasted for several days, and required constant restraint. While in this condition he succeeded on one occasion in getting out of bed. Four days after the operation he was again perfectly rational. There was a slight discharge from the granulating wound. He continued to improve, and on November 7 he was able to sit up for a short time. On this day he began to complain of pain in the rectum, with a constant inclination to defecate, although his bowels had not moved in thirty-six hours. The pain in the rectum persisted, and an examination revealed a soft, fluctuating mass bulging into the anterior wall of the bowel, about three inches above the sphincter. There was also tenderness above the pubes.

On November 8 Dr Chase, the assistant surgeon, made a median incision below the umbilicus, and found the intestines matted together into a large mass. The bladder could not be recognized at first, but upon inserting a sound, it was found to the right of this mass, bound down by adhesions. Upon attempting to free it a large abscess cavity occupying Douglas's pouch was opened, followed by a free escape of very foul-smelling pus and flakes of fibrin. When the bladder was freed, it immediately resumed its normal position. The adherent loops of intestine were freed as far as possible, and in doing this numerous small pockets of pus were evacuated. The abdomen was thoroughly irrigated with saline solution, and a large cigarette drain inserted leading down into Douglas's pouch. On the following day the patient had a free movement of the bowels. His further recovery was uninterrupted, and he was discharged from the hospital on December 4.

DR WILLY MEYER referred to a similar case coming under his care. Eleven days after an operation for perforative appendicitis the patient developed all the classical symptoms of intestinal obstruction, and upon reopening the abdomen he came down upon a mass of matted intestine and omentum. Upon separating the adhesions he again heard the peculiar gurgling sound indicating intestinal obstruction, and upon further investigation he found in the left lumbar region an abscess containing a large amount of stinking pus. This was evacuated and drained. The intestinal obstruction promptly disappeared and the patient eventually made a perfect recovery.

DR F KAMMERER said the cause of the intestinal obstruction

described by Dr Hotchkiss was certainly a very rare one. It was at times difficult to differentiate between intestinal obstruction and a well-developed peritonitis, with symptoms of obstruction. Even if peritonitis was not general, such symptoms might be present. That a circumscribed collection of pus, however, should give rise to acute intestinal obstruction in a mechanical way he was somewhat loth to believe. It rather seemed to him that after evacuation of the abscess such mechanical disturbances might arise.

DR WILLY MEYER said that in his case there was no reason to suspect that the obstruction was a retroperistalsis due to acute peritonitis, for eleven days had elapsed since the operation and the patient was practically well when the symptoms of obstruction suddenly intervened. The speaker said he did not attribute the obstruction to the presence of the abscess, but to a kink of the matted intestines that formed the wall of the same.

DR LILIENTHAL said he thought the mere fact that pus was present had nothing to do with the case. The important factor was the mass of adhesions, which in the cases reported by Drs Hotchkiss and Meyer happened to form the wall of an abscess. Adhesions resulting from anything else might likewise give rise to obstruction.

DR HOTCHKISS said that a few years ago he had read a paper before the Society in which he reported three cases of obstruction following appendicitis occurring in the course of his own work, and also a number of cases observed by others. It seemed to him that these cases may be divided into two classes. First, those in which the obstruction occurs in the afebrile period, that is to say, from two or three weeks to two or three months or longer after the original operation. These cases are easily to be recognized, and are due either to kinking of the gut by adhesions or its strangulation by bands. The second class embraces those cases which come on soon after operation, or as early as the second or third or fourth day later, that is, during the afebrile period, and which are generally regarded as cases of extending peritonitis, which are not operated upon, and are generally fatal. These latter cases, which are often masked by symptoms of peritonitis, he regarded as the most dangerous because they are most often unrecognized. That these cases can be successfully dealt with by prompt operative measures he thought had been abundantly demonstrated.

GASTRODUODENOSTOMY (FINNEY'S METHOD)

DR HOWARD LILIENTHAL presented a man, forty-two years old, who was admitted to Mt Sinai Hospital on May 21, 1903. He had been sick for three years with constantly increasing abdominal discomfort, associated with vomiting. The vomited matter consisted principally of mucus and food, never blood. The patient's symptoms gradually became more aggravated. He became emaciated, and a physical examination of the chest revealed dulness over both apices. Tubercle bacilli were found in the sputum.

An examination of the stomach contents revealed the presence of free hydrochloric acid, and after further observation a diagnosis of benign stenosis of the pylorus was made. May 23 gastro-duodenostomy by the Finney method was done, and the wound was closed with a cigarette drain. The next day the man vomited some blood and his temperature was slightly elevated. There were no other untoward symptoms, and six days after the operation the man was allowed solid food. He was discharged June 13 entirely well. Since then he had gained sixty pounds in weight, and his pulmonary and abdominal symptoms had entirely disappeared.

RESECTION OF PYLORUS FOR BENIGN STENOSIS

DR FREDERICK KAMMERER presented a woman, fifty-three years old, who had been under treatment since last summer for gastric trouble which dated back to May of the present year. She had been under the care of various physicians. She complained of all sorts of gastric disturbances, including sour taste, eructations of gas, vomiting, etc., in short, symptoms of gradually increasing stenosis of the pylorus. When the speaker first saw her, about two or three months ago, she presented the typical picture of pyloric stenosis. The stomach was dilated, reaching midway between the umbilicus and symphysis. She vomited frequently, and when her stomach was washed out particles of food that had been introduced two or three days before were found. Peristaltic movements of the stomach were readily visible through the abdominal walls. At a previous examination, before her admission to the hospital, lactic acid and hydrochloric acid in small quan-

tities were found in the stomach contents, but when the latter were examined at the hospital, two months later, hydrochloric acid was absent. To the left of the umbilicus a freely movable, hard tumor, about the size of a walnut, was distinctly made out through the lax abdominal wall. A blood examination showed between 40 and 45 per cent of hæmoglobin.

Through a median incision the stomach was exposed and a tumor about the size of a small egg was found involving the pylorus. A resection was done by the usual method, removing the entire lesser curvature and at least one-half of the greater curvature far beyond the actual site of the growth. Instead of employing Kocher's clamps, as he usually did in these operations, Dr Kammerer said he used Mikulicz's clamp on this occasion. About one inch of the duodenum was also removed. The open ends of the stomach and the duodenum were now closed by a double running suture of silk, and a posterior antecolic gastro-enterostomy performed, the parts being easily approximated without the slightest tension. A Murphy button was used. The patient made a good recovery. The button passed on the eleventh day. A microscopic examination of the growth showed it to be purely fibrous. In the course of the operation two infiltrated glands were found and removed,—one was located in the lesser and one in the greater omentum. The case illustrates the difficulties of an accurate diagnosis between malignant or benign stenosis in some cases.

CHRONIC PANCREATITIS

DR KAMMERER presented a woman, forty-eight years old, who had enjoyed good health up to eight weeks before her admission to the hospital. She gave no history of jaundice or malaria, but had had repeated attacks of rheumatism. For the past eight weeks she had suffered from pain in the epigastrium, general gastric distress, and occasional vomiting. About a fortnight before her admission her symptoms became more acute, and she suffered from severe pain in the abdomen and lumbar region and in the legs. Her appetite was poor, she had constant headaches and felt feverish. At about this time jaundice appeared and had persisted since.

When she came to the hospital, October 14 of the present year, the jaundice was very marked, but otherwise the examination proved entirely negative. She was kept under observation for several weeks, during which time she became more deeply jaundiced, and in order to clear up the diagnosis an exploratory operation was done October 26. The gall-bladder was found to be of normal thickness but somewhat enlarged and filled with bile. No stones could be detected. The common duct was thoroughly exposed by incising the peritoneum to the outside of the duodenum and entering the retroduodenal space, but nothing abnormal was found. The surface of the liver was slightly nodular, and the possibility of a beginning cirrhosis suggested itself. Upon examining the pancreas, a distinct tumor in the head of that organ was made out. It was about the size of a small egg and clearly outlined. A cholecystoduodenostomy was done, when, upon opening the duodenum, a large amount of bile escaped into the intestine, showing that the obstruction, which was apparently due to the tumor in the head of the pancreas, had been at least momentarily overcome (most probably by manipulation with the gall-bladder). The patient made an uneventful recovery from the operation, and has improved wonderfully since. The jaundice gradually disappeared and has not recurred.

Dr Kammerer said he regarded the case as one of chronic pancreatitis which had been relieved by the operation. Whether it would have been wiser to do a simple cholecystotomy was an open question.

In reply to a question as to whether he followed the common bile duct as it entered the head of the pancreas, Dr Kammerer said he was satisfied that it contained no stone.

Dr WILLY MEYER said he had a similar case about three years ago. The patient was also a female, with pronounced jaundice. No stone was found, nothing but this infiltration involving the head of the pancreas. He did a cholecystostomy which resulted in quite a troublesome fistula, but the wound finally closed permanently. Dr Meyer said that in the treatment of this class of cases he would perhaps try first a cholecystostomy, and that failing, he would resort to permanent union between the gall-bladder and intestinal tract.

GASTRO-ENTEROSTOMY WITH ENTERO-ENTEROSTOMY
(ELASTIC LIGATURE)

DR WILLY MEYER presented a man, sixty years old, who had had an intestinal hæmorrhage in 1894, and after its occurrence he began to complain of symptoms of chronic gastritis. These were not serious enough to interfere with his business until one year ago, when, while travelling abroad, he had a fainting spell and vomited. The vomited matter did not contain any blood, but on the following day he had a large, tai-like stool. From this attack he slowly recovered, and afterwards all his former gastric symptoms increased in severity. He was treated by a number of specialists, both here and abroad, who washed out the stomach and advised against operative interference.

In August, 1903, he had a third intestinal hæmorrhage. He became much reduced in weight and strength, and finally consented to an exploratory operation. The specialist who had been consulted abroad thought the lesion was an ulcer of the pylorus, but when the patient was admitted to the German Hospital in this city, a chronic ulcer of the duodenum was regarded as the probable diagnosis.

Upon opening the abdomen, nothing was found on the anterior or posterior stomach wall nor at the pylorus, but a thickened area in the duodenal wall could be distinctly made out. A posterior gastro-enterostomy was thereupon done by the McGraw (elastic ligature) method, the No. 3 ligature being employed. In uniting the stomach and small intestine, a continuous suture was used, and this gave rise to so much tension later, when tightening the ligature, that a tear in the stomach wall occurred. This was immediately closed with four interrupted sutures. In order to avoid the formation of a vicious circle, an additional entero-enterostomy was done also by means of the elastic ligature.

The patient made an uninterrupted recovery, and was given liquid nourishment by the stomach at the end of forty-eight hours. He had a few attacks of vomiting shortly after the operation, but was able to leave his bed in five weeks. Since the operation he had gained over twenty-five pounds in weight, and had had no further gastric symptoms.

ARTHROTOMY FOR IRREDUCIBLE SUBCORACOID
DISLOCATION

DR. LUCIUS W HORCHKISS presented a man, thirty-eight years old, an iron-worker, who was admitted to the hospital last July for an irreducible dislocation of the right shoulder-joint of ten weeks' standing. The dislocation was of the subcoracoid variety, and it could not be reduced by any of the usual methods.

July 28, 1903, an arthrotomy was done to effect reduction. The usual incision was made between the pectoralis major and deltoid, and the head of the bone exposed. It was extremely difficult to make out the exact anatomical relations of the parts, and before reduction could be accomplished it was found necessary to divide, in succession, the long and short heads of the biceps and all the muscles attached to the greater tuberosity. It was impossible to make out what particular muscle had prevented reduction before their division, though the subscapularis was last divided, and after this reduction was effected. The wound healed by primary union, and the arm was treated first by passive and subsequently by active motion. Since the operation, the function of the limb had gradually improved, and the man had returned to his work and was again able to use a heavy sledge-hammer. The head of the bone was now in its proper position, but ankylosed, and the range of motion constantly increasing.

Dr. Hotchkiss said that in another case of irreducible subcoracoid dislocation in which he had also performed arthrotomy last summer, the operation was done for persistent neuralgia caused by pressure of the head of the bone on the brachial nerves. The pain was entirely relieved by the operation, and the functions of the shoulder-joint, which in this case were very good before the operation, were not impaired.

DR. JOHN F. ERDMANN said that about a year ago he saw a case of subcoracoid dislocation in which the capsule of the joint had a button-hole tear which grasped the neck of the humerus, preventing its reduction by the usual methods, that in addition there was a complete evulsion of the greater and lesser tuberosities, and that the long head of the biceps was displaced outward and wound spirally around and posterior to the head of the humerus. Operation was done, a torn portion of the tuberosities was removed, capsule was split transversely, and the tendon of

the biceps reduced, this procedure being followed by easy reduction, the tear cut in the capsule was sewn as much as possible, although a gap was left in the tear about one-quarter inch wide. This was bridged over by a continuous suture of kangaroo tendon.

Patient when shown had practically all the functions with which the shoulder-joint is endowed, except that of retaining the arm in condition of hyperextension from the body.

DR WILLY MEYER said that Dollinger considered the subscapular muscle to be the chief offender in the prevention of reduction in this form of shoulder dislocation. As soon as its tendon had been divided, and no other besides, reduction generally was feasible.

DR HOTCHKISS said that, although the head of the humerus was underneath the coracoid process, there was a distinct membrane covering the head of the bone. Probably the lower end of the capsular ligament had been torn, and a portion of it had been carried forward with the head. The long head of the biceps was cut because it was very taut, and apparently was partly responsible for the interference with reduction.

POSTOPERATIVE INTESTINAL OBSTRUCTION

DR GEORGE E. BREWER presented a girl, thirteen years of age, who was admitted to the Surgical Division of the Roosevelt Hospital, in October last, suffering from abdominal pain, vomiting, and general weakness. One year before admission she had undergone an operation for acute appendicitis with abscess, from which she slowly recovered.

The present illness began five days before admission, with colicky pains in the abdomen and slight distention. Various cathartic remedies were employed, but without result. The lower bowel was emptied by an enema. The vomiting was at first moderate, but became more violent and persistent during the second and third days. On the fourth and fifth days there was an apparent subsidence in the acuteness of the symptoms, but no movement from the bowels or passage of flatus, although high enemata were constantly employed. On the sixth day of her symptoms she was seen by the writer, who found her in an extremely critical condition, the temperature was 101° F, the pulse 120, weak and compressible, the face drawn, the eyes sunken, the extremities

cold, and the entire body bathed in cold perspiration. There was considerable distention of the abdomen, with tenderness and slight rigidity over the lower right rectus muscle.

She was immediately prepared for operation, and under ether anaesthesia an incision, eight inches in length, was made through the right rectus muscle, and the transverse colon sought for and found to be collapsed. The caecum was next examined, and also found to be empty. The ileum, at its junction with the caecum, was found and traced downward to the pelvic cavity. About seven inches from its colic extremity it was found to be acutely constricted by a loop passing under a firm fibrous band, the result of her former appendicitis. Beyond this loop the small bowel was greatly distended. As soon as the constriction was relieved, fluid and gas were seen and heard to pass rapidly to the colon. The point of constriction was dark in color and ulcerated. It was protected by suturing a layer of the omentum over its injured segment, anchored near the cutaneous margin, and a large Mikulicz tampon introduced, as it was feared a fistula would result. The tampon was allowed to remain in place two weeks, after which the wound slowly healed. The recovery was uneventful.

GASTRO-ENTEROSTOMY

DR JOHN ROGERS, JR., read a paper with the above title, for which see page 512.

DR WILLY MEYER said his experience with gastro-enterostomy by the elastic ligature method was limited to four cases. Of these, three had recovered and one died, probably of acetonæmia or of sepsis. If the technique of the method was properly carried out, he did not see how the ligature could fail to cut through. He preferred the No. 3 ligature, which was certainly strong enough for the purpose. A very favorable feature of the method was that it effected an anastomosis of good size, at least one or two inches. Another point in its favor was that it could be done very rapidly. The speaker said he was formerly a strong advocate of the use of the Murphy button in these cases, but one serious objection to its use was that it was apt to fall back into the stomach and eventually do harm. The latter was not always the case, however, as he knew of one instance where the button was located in the stomach by means of the X-rays five years after operation and its presence there had apparently not given rise to any injurious symptoms.

DR ERDMANN said that in one case where he did the McGraw operation the patient, a man sixty-two years old, died on the seventh day from asthenia. The patient was fed by the mouth on the third day, this apparently set up vomiting, and rectal feeding was again resorted to. At the autopsy, a section of the stomach and intestine was removed, and the stomach wall showed a distinct slough, about the size of a silver quarter, which apparently would have come out in the course of another twenty-four hours. The slough consisted of that portion of the stomach wall that was tied off by the ligature, and the question arose in his mind whether by this method (the McGraw) the tissues were cut through or caused to slough out. There was no peritoneal invasion.

Dr Erdmann said that this class of patients was usually asthenic, and the early introduction of food into the stomach was a very important factor. On that account he favored the use of the Murphy button, which was usually surrounded by a sufficient plastic exudate in the course of eight or ten hours after the operation to permit the introduction of peptonized milk into the stomach. In one case where he used the button the patient was able to sit up in bed in twelve hours and take broth and peptonized milk.

DR JOHN B WALKER said that his experience had led him to favor the posterior operation, suturing if possible, if this could not be done, he used the Murphy button, and did an entero-enterostomy to avoid the formation of a vicious circle.

DR F KAMMERER said he had found the posterior operation with the button entirely satisfactory, and he had never had a vicious circle occur. He did not think it necessary to do an additional entero-anastomosis when the posterior operation was done. In former years, when he used Abbe's rings and Senn's plates and the simple suture, and operated by the anterior method, the formation of a vicious circle was not infrequently observed. The speaker said he thought the application of the McGraw ligature and the running suture would take fully as much time as the introduction of the Murphy button without the reinforcing sutures, the latter he did not think were essential, and he never used them.

DR WILLY MEYER said the possibility of the Murphy button dropping back into the stomach was an objectionable feature to its use in gastro-enterostomy. If this accident could be success-

fully eliminated, it would represent the best artificial means of doing this operation. So far, we had no means at our disposal to surely prevent its occurrence. By the application of the ligature of sutures the use of this foreign body could be avoided. It should not be employed in those cases where there was any suspicion of an ulcer of the stomach.

DR. HOWARD LILIENTHAL said he thought the subject could be divided advantageously into two parts,—one relating to malignant and the other to non-malignant cases. In the latter class of cases he had done the Finney operation four times, and it apparently left nothing to be desired. It was simple, rapid, and clean, and in all four of his cases the patients made a rapid recovery. His last case was one in which the Finney operation was secondary to an operation for pyloric stenosis, in which he had found a band constricting the duodenum. This was divided and the cause of the obstruction was thought to be relieved, but no relief in the symptoms followed the operation. Four days later the wound was reopened and a Finney operation was done. The pylorus itself proved to be the real cause of the obstructive symptoms. The speaker said that Finney himself did this operation also in cases where there were good-sized masses and adhesions about the pylorus, and where, under ordinary circumstances, another operation would be considered preferable. In the malignant cases in which gastro-enterostomy without any resection was indicated, Dr. Lilienthal said he was very much in favor of the button. He knew of cases where the button dropped back into the stomach, and had even devised a special button to prevent the occurrence of that accident. One-half of this button was big, the other half small, he had never had this modified button drop back into the stomach, nor had he seen this accident occur with the Weir button. The posterior operation was the one he always favored. The speaker recalled one case where two Murphy buttons were used in the abdomen, and both failed to pass. They were subsequently located by the X-ray in the right iliac fossa. The patient complained of cramps, and was advised to have the buttons removed by another operation, but he was lost sight of.

Dr. Lilienthal said he was induced to try the McGraw method of gastro-enterostomy in a single instance. In tying the ligature, he tied it as firmly as he could, but the patient's symptoms were apparently unrelieved by the operation, which was an anterior

one After ten days had elapsed he again opened the wound, and with the exploring finger he could feel the McGraw ligature in its original position It had apparently not cut through Another ligature was thereupon placed about an inch distant from the original one, but the patient continued to vomit, and, although two weeks had elapsed, her symptoms were unrelieved While he was contemplating a third operation the patient suddenly began to improve, and, although the ligature was never found in the stools, he had every reason to believe that the operation proved successful The patient's vomiting ceased and her general condition improved, but Dr Lilienthal said that his experience with the McGraw method in this case had proven so unsatisfactory, that he would not resort to it again if he could help it

DR ROGERS, in reply to a question, said that a few writers mentioned the possibility of a recurrence of the symptoms after operation for benign stricture of the pylorus, from cicatricial contraction of the operative fistula, and emphasized the importance of narrowing the pyloric outlet The speaker also said he recently heard of a case of gastro-enterostomy in which the Weir button had dropped back into the stomach, and had to be subsequently removed by operation The McGraw elastic ligature method, which Dr Meyer favored, had very few advocates He did not think it possessed any advantage over the button as a time-saving method, and the reports of failures by this and all two-stage methods were so frequent that at least they could not be considered the methods of choice

Stated Meeting, December 23, 1903

The President, HOWARD LILIENTHAL, M D, in the Chair

ACUTE TRAUMATIC STRANGULATED HERNIA

DR IRVING S HAYNES presented a man, aged thirty-eight years, who, in going down an areaway steps, stumbled and fell, striking his left groin against a projecting corner of the stone coping He was at once seized with an agonizing pain, and his

condition was such that an ambulance was summoned and he was taken to the hospital, where he arrived in a state of almost collapse. Upon examination, a swelling was found over the external ring, and a diagnosis of acute strangulated hernia, of traumatic origin, was made. The House Surgeon was instructed to operate immediately, and upon slitting up the external oblique he found that the hernia had broken through the fibres of the internal oblique and transversalis just above the conjoined tendon. The peritoneum was not ruptured. The hernial sac was opened, and a coil of very dark, œdematous gut was found and reduced.

A further examination revealed a second swelling at the internal ring, and upon slitting up the fascia this proved to be an ordinary congenital hernial sac, for which the usual Bassini operation was done. It was subsequently learned that three years before the man had noticed a small, tender lump in the left groin. He consulted a surgeon regarding it, who told him that he had a hernia, and advised a truss. The hernia did not cause the patient any inconvenience, but soon disappeared, and he did not follow the surgeon's advice.

In reply to a question, Dr. Haynes said there were no symptoms pointing to injury of the cord or testis. The patient made an uneventful recovery and left the hospital on the twelfth day after the operation.

DR. BERN B. GALLAUDET said he thought a sharp distinction should be drawn between the hernia and the sac in so-called traumatic herniæ. In the true traumatic type, of which there are a few on record, there is no hernial sac, the hernia having simply broken through the peritoneum and is found in the tissues of the scrotum without any sac. In the common variety, on the other hand, the sac is present from birth and the hernia is the result of the trauma.

DR. HAYNES said that the direct hernia to which he had applied the term traumatic, was through the ruptured muscle. The peritoneum was not ruptured. The second hernia found was of the ordinary congenital type.

TRAUMATIC PYELOPARANEPHRIC CYST

DR. BERN B. GALLAUDET read a paper with the above title, for which see page 573.

DR. BREWER said that injuries affecting the kidney region

were always interesting, especially in some of their later manifestations. A very slight injury was sometimes sufficient to produce a rupture of the kidney. The speaker said that the case reported by Dr. Gallaudet reminded him of a rather rare condition to which Morris had called attention, in which rupture of one of the branches of the renal artery was followed by the formation of a hæmatoma, sometimes of enormous size, with a tenacious capsule. The condition Morris described, however, was of very rapid formation, and sometimes disappeared spontaneously.

CYSTIC KIDNEY

DR. PARKER SYMS presented a specimen removed from an extremely neurotic woman, thirty-nine years of age, who had been referred to him with a diagnosis of floating kidney. When Dr. Syms saw the patient in consultation, he found a floating kidney, but it could be readily made out that the organ was not of normal size. It was much enlarged and distinctly lobulated, and very freely movable. The woman was practically an invalid, suffering from the pressure of the kidney on the pelvic organs.

The operation was performed at Stamford, Connecticut, on December 14, Drs. Pierson, Tiffany, and Sherrill assisting.

The incision was made parallel to the twelfth rib, and had to be extended far forward owing to the size of the kidney. When the peritoneum was reached, it was not opened, but was pushed from the wall. An enormously enlarged cystic kidney was found. Apparently there was but little renal tissue left, so the organ was removed, though with some doubt as to the ultimate outcome, on account of the well-known fact that in these cases of cystic kidney both organs are apt to be involved.

Before operation careful examination had been made of the other side, and, though the woman was an extremely thin one, with flaccid abdominal walls, the right kidney could not be palpated, and therefore it was inferred that it was not cystic, or if cystic it was in far better condition than the organ removed.

Before removing the kidney, Dr. Syms and the others debated as to the advisability of opening the peritoneum and passing the hand across the interior of the abdomen to palpate the right kidney, but the woman was so feeble before operation that it was decided best not to subject her to any unnecessary manipulation.

The enormous kidney was delivered and removed, the vessels and ureter being tied separately, the latter being cauterized. The kidney measured seventeen inches in circumference and was made up of a number of cysts. There was apparently a very small area of renal tissue in the region of the pelvis.

The operation was performed December 14. On December 29, a letter from Dr. Pierson reports the patient as having made satisfactory progress, showing that her remaining kidney is performing sufficient function and indicating that the operation was a wise one.

DR. HAYNES said that some years ago he saw a woman, forty-five years old, who was brought to the hospital complaining of a severe pain in the lumbar region. A firm tumor could be felt over the region of the left kidney, which upon operation proved to be one of these cystic kidneys. It was enormously enlarged, and he decided to remove it. The kidney measured nine by four by three and one-half inches. About a fortnight later the woman died of uræmia, and at the autopsy the opposite kidney was also found to be in a cystic condition. The speaker said he thought the consensus of opinion was that these cystic kidneys had better be left alone. In the case he had in mind the remaining kidney was much enlarged, but it could not be palpated at the time of the original operation.

DR. LILIENTHAL said that in view of Dr. Haynes's experience he would not feel inclined to remove one of these cystic kidneys unless he could feel assured that the opposite kidney was at least fairly normal. Before removing a kidney for any cause, he thought it was a good plan to ascertain the condition of the opposite kidney by incision and palpation. This second incision entailed very slight additional shock, and the speaker said he did not consider it any more dangerous than it was to catheterize the ureter of the opposite kidney in suppurative cases. The latter procedure he disapproved of.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting, December 7, 1903

HENRY R. WHARTON, M D, in the Chair

CHOLECYSTOTOMY

DR LEWIS W. STEINBACH presented three patients who had been subjected to operation for cholelithiasis.

The first case was a woman, aged forty years, who was admitted to the Polyclinic Hospital, June 17, suffering since one o'clock in the morning with intense abdominal pain, which could not be relieved by hypodermic injections of morphine administered within the limits of safety. There was vomiting, tenderness over upper half of the abdomen, and a slight yellow discoloration of the scleræ. An immediate operation was decided upon. The patient was anæsthetized with ether. A long incision through the abdominal parietes exposed an enlarged, tense gall-bladder, in which no stones were felt until after evacuation of the fluid contents by means of a trocar. The fluid evacuated approximated eight ounces in quantity and resembled normal bile. The neck of the bladder contained three gall-stones, while a fourth was separated by a valve-like partition and was removed with some difficulty, the thumb and forefinger of the right hand steadying the cystic duct while the left hand manipulated forceps or scoop. The stones were globoid with facets, were of almost equal size, each one having about three-fourths of an inch in diameter. A sound was passed into two branches of the hepatic duct and into the common duct without detecting other calculi. In order to verify this condition, a colleague probed the biliary passages and perforated the common bile duct. An elongated gauze pad was placed in contact with the perforation in the com-

mon duct, a large rubber drainage tube was inserted into the distended cystic duct and stitched with the edges of the incision in the gall-bladder to the parietal peritoneum at the lip of the abdominal incision, the sutures were permitted to remain long. Three additional stitches secured the gall-bladder to the peritoneum. The abdominal wall was closed with through-and-through silk-worm-gut sutures, except where it was required to leave an open space for the removal of the gauze pad. On the day following the operation, healthy bile in large quantities saturated the dressings, the urine was free from bile pigment. On the ninth day the patient was allowed house diet, on the eleventh day the sutures were removed, and the drainage tube on the twelfth day. Patient was sitting up on July 7. Discharge of bile diminishing gradually, ceased entirely by July 8. Patient is well and comfortable and was discharged as cured on July 23. Observation continued until November. Patient remains free from pain, has no jaundice, gall-bladder cannot be palpated, enjoys excellent health.

The second patient was a woman, thirty-eight years of age, mother of nine living children, who, since the birth of her first child, twenty-one years ago, had suffered at intervals from attacks of pain in the region of the gall-bladder accompanied with jaundice. The attacks at first came at intervals of one or more years, gradually becoming more frequent. For the past three months the attacks came every week and had remained continuous for the past three weeks. Patient takes very little food, has lost much of body weight, and is said to have had obstinate constipation, for the relief of which various purgatives, including croton oil, have been administered by different practitioners. On admission, on August 13, to the Polyclinic Hospital, her temperature was 100.6° F, pulse, 96, respirations, 24. Decidedly jaundiced. Systolic murmur at apex. Urine is dark reddish-brown, acid, specific gravity 1040, no albumen, no sugar. On August 14, operation under chloroform anæsthesia, the patient being prepared by thorough purging with magnesium sulphate enemata and lavage of the stomach immediately before the operation. Incision about six inches long was made over gall-bladder. Gall-bladder exposed and found adherent to the omentum. Adhesions were ligated and divided. The gall-bladder was aspirated and several ounces of greenish-brown, turbid fluid withdrawn.

About twenty many-faceted stones were removed from the gall-bladder with forceps and scoop, after it had been opened by an incision one and one-half inches long. The gall-bladder was thoroughly washed out. With the finger in the abdomen, several stones were pressed into the gall-bladder from the common and cystic ducts. Irrigator could then be passed into the common and hepatic ducts, which were flushed out, and on probing found free from calculi. In all eighteen large gall-stones one-third of an inch in diameter and nine small ones were removed. A large-sized drainage tube was passed into the gall-bladder and fastened to its edges by a silk suture whose ends were left long. The bladder was stitched to the peritoneum with catgut sutures, cut short, and with one silk suture whose ends were left long. Abdominal incision closed with through-and-through silkworm-gut sutures. Bile discharged freely through the tube into the bottle immediately after the operation, the amount gradually lessening day by day. On the ninth day the sutures were removed and the drainage tube on the tenth. Jaundice disappeared entirely and the urine was free from bile pigment. The patient was discharged on September 3, twenty days after operation, with moderate discharge of bile and mucus. The sinus did not close completely until three weeks later. In October and again in November patient has had an attack of colic accompanied by jaundice.

The third patient was a man, aged forty-four years, who had had during the past three years several attacks of colic, for the relief of which narcotics had to be administered, never marked jaundice. Operation under ether anæsthesia preceded by lavage of the stomach. Long abdominal incision exposed a contracted bladder containing numerous small calculi, the cystic, common, and hepatic ducts likewise filled with biliary gravel. Irrigation of gall-bladder and ducts. The case was treated like the preceding one. The discharge was moderate in amount, greenish mucus, never resembling healthy bile. Drainage tube was withdrawn and reinserted on the fourth day, sutures removed on the ninth day, patient sitting up on the tenth day. On September 8, the gall-bladder was irrigated and three small calculi washed out. Patient was discharged on the nineteenth day after operation, with one abdominal suture remaining and the sinus discharging small quantities of bile-stained mucus. After complete closure

of the orifice, the gall-bladder became distended and palpable. Patient remains well.

It remains to be pointed out that ever so careful a probing and irrigation have failed in two out of three cases to remove all the calculi during the operation. In one instance they passed subsequently through the drainage tube, whilst in the other case they are passing through the cystic or common duct.

RUPTURE OF THE LIGAMENTUM PATELLÆ

DR GEORGE G. ROSS reported the case of a man, forty years of age, who was admitted to the German Hospital, September 27, 1903, with an injury to the right knee. A wagon toppled over, striking him on the back, he was forced into a kneeling position, the legs being flexed on the thigh and the thigh on the body. He could stand on the right limb after being released from the very uncomfortable position, but could not extend the leg.

On admission there was moderate distention of the joint, pain, and tenderness. There was a separation of about two inches between what was thought to be a fracture of the lower half of the patella. An X-ray negative showed the separation and a deeper shadow at the position of the supposed lower fragment. It was accordingly diagnosed as fracture of the lower end of the patella, the fragment being very small.

On September 30, the joint was laid open by a longitudinal incision and the patella exposed. The patella was found to be intact and uninjured. The ligamentum patellæ was torn completely through about one-half inch below the lower border of the patella. The shadow on the X-ray plate, which was thought to be a fragment of patella, proved to be a small blood-clot.

The torn ends of the ligament, which were badly frayed, were trimmed up and united by kangaroo tendon, the upper loops of the continuous suture including the capsule of the patella. The superficial wound was closed and the limb placed in a plaster case. The patient made an uneventful recovery, and at the present time has a very fair functioning joint. Extension is good, and there seems to be a complete union between the ends of the torn ligament.

DR FRANCIS T. STEWART, as illustrating the result that might be secured by sewing together the ends of a divided quadriceps ex-

tensor tendon, mentioned a sailor who had had the tensor severed by a knife thrust. Three months after the injury he was seen by Dr Stewart, who found the joint distended with fluid and a distinct depression above the patella, the patient being unable to extend the leg. The diagnosis of severed tendon was made, and by an anterior incision the depressed area was exposed. The severed ends of the tendon were found to be separated a distance of four inches in the middle line, this distance gradually diminishing as the muscles at either side were approached. With some difficulty the ends were approximated and sutured with kangaroo tendon. The knee was immobilized for three weeks. The functional result was practically perfect, as the patient was able to resume his occupation and work in the rigging as before the injury was received.

ACUTE INTUSSUSCEPTION OCCURRING AS A COMPLICATION OF TYPHOID FEVER

DR GEORGE G ROSS reported the history of a lad, seventeen years of age, of good family and personal history, who was admitted to the German Hospital on the eighth day of an attack of typhoid fever. Temperature ran fairly regular course, although the daily range of temperature was considerable, the difference between highest and lowest for a day being as much as 3° F. The highest recorded temperature was $104\frac{3}{5}^{\circ}$ F.

On the twenty-first day he had a blood-stained, liquid stool. Tubbing stopped. On the twenty-fifth day the highest temperature was 102° F, the lowest 101° F. The tub baths had been resumed at patient's request. At 8 P M, temperature, $101\frac{3}{5}^{\circ}$ F, respiration, 24, pulse, 112. After bath, temperature, $99\frac{3}{5}^{\circ}$ F, respiration, 24, pulse, 104. At 9 40 P M, hæmorrhage, 120 cubic centimetres. At 11 35, another hæmorrhage, 650 cubic centimetres. Temperature, $99\frac{3}{5}^{\circ}$ F, respiration, 24, pulse, 96.

At 1 30 A M of the twenty-sixth day patient awoke with a violent abdominal pain without any particular point of intensity, there was some rigidity of the right rectus muscle. The patient screamed with pain for fifteen minutes, and was only relieved by morphine. At 2 A M, temperature, 98° F, respiration, 20, pulse, 80. At 4 40 A M he had another hæmorrhage, 820 cubic centimetres. Between the time of onset of the pain and 3 30 A M there was a slight increase in the abdominal distention. There

was a leucocytosis of 16,000. It was thought that the patient had had a perforation, and the abdomen was accordingly opened without further delay.

Immediately upon opening the peritoneal cavity it was evident that perforation had not occurred, as there was entire absence of gas or faecal matter. There was no lymph or inflammatory exudate. It was thought wise to make a search of the small intestine. The terminal twenty inches of ileum was moderately distended, and showed the typhoid ulcers and the bleeding points very distinctly through the thin bowel wall. From this point to the duodenum the bowel was completely collapsed. About three feet from the junction of the duodenum and jejunum an intussusception about two and a half to three inches long was discovered, the invagination being from above downward. It was readily reduced and the bowel slowly distended. The sides of the invaginated portion were slightly sticky, and very soon would have become adherent. The peritoneal cavity was filled with salt solution and the abdominal wound closed without drainage. Intravenous transfusion of 1000 cubic centimetres salt solution was given. The patient's temperature remained at 98° F after operation, rising gradually to 101° F.

On the twenty-seventh day the patient had two hæmorrhages, one of 120 cubic centimetres and one of 250 cubic centimetres.

Temperature normal on the twenty-eighth day.

Thirty-fourth day, temperature normal and the patient's general condition good. He has since made an uneventful recovery.

DR W W KEEN said that the case of intussusception reported by Dr Ross as occurring during the course of typhoid fever was extremely unusual. No case of the kind was recorded in his book on the "Surgical Complications and Sequels of Typhoid Fever," published in 1898, and covering the results in 1700 cases.

DR JOHN B DEEVER said that the case of intussusception showed the importance of operating early in the presence of urgent abdominal symptoms during the course of typhoid fever. Had this case been allowed to continue, obstruction would undoubtedly have occurred, and perhaps made necessary an extensive operation, which in the enfeebled condition of the patient would have been exceedingly dangerous.

DR Ross rejoined that during a somewhat extensive search

of the literature he had found intussusception during typhoid fever mentioned in three instances, one in an article on typhoid fever by Dr J C Wilson, in Keating's "Encyclopædia of the Diseases of Children" There the condition was simply mentioned without reference to actual cases Two cases are on record, one by Ash (*British Medical Journal* for May 3, 1903), in which operation was done and the patient recovered The second case was reported by Watkins Pitchford in the *British Medical Journal* for September, 1902 In this case the condition occurred during convalescence from typhoid, and was only discovered at the post-mortem Both of these reports were kindly furnished by Dr John H Gibbons

GANGRENE OF THE SUPERFICIAL FAT OF THE ABDOMINAL WALL, FOLLOWING OPERATION FOR INCARCERATED UMBILICAL HERNIA

DR ROSS reported the history of a woman, aged sixty-seven years, and weighing 250 pounds, who had an umbilical hernia of twenty years' standing, which had been irreducible for twenty-four hours before her admission to the Germantown Hospital, October 23, 1903 The abdomen was pendulous and flabby Bowels had not moved for forty-eight hours, severe crampy pains Pulse, 104 Tongue moist, coated white There was a large hernial protrusion about the size of a small melon extending half-way to the symphysis pubis The covering of the hernia consisted of attenuated skin and peritoneum which had become adherent one to the other The sac when opened contained a large knuckle of gut and omentum, which was tightly adherent to the inner side of the sac, but had not ulcerated through The gut was not strangulated, although the faecal circulation had been cut off The gut was reduced and the adherent omentum loosened, tied off, and reduced The sac was removed close to the peritoneal opening, which was closed with kangaroo tendon The closure was reinforced by lateral flaps of aponeurosis The wound was closed and rubber drainage introduced, coming out at the lower angle of the wound The pressure of the sac and its contents had destroyed the fat in the superficial fascia for an area corresponding to the size of the tumor

The patient was not shocked after operation The pulse went down to 80 and the temperature to normal The bowels

moved on the second day, and she vomited but once after ether Drainage tube was removed on the third day, at which time a foul odor was noticed The superficial fat was gangrenous The gangrenous process spread until it involved the entire right side of the abdominal walls down to the loin space The wound above the tube healed by first intention

The urine was lost in bed, so that only an estimation of the amount could be arrived at It was probably above normal Several specimens examined on different days showed albumen, casts, but no sugar The patient developed slow coma without delirium, and died in coma Two days before death a patch of gangrene developed on the right thigh just below Poupart's ligament

The operation wound had healed by primary union, and had not become involved in the gangrenous process, which had been confined to the superficial fat, not involving the aponeurosis below or the skin above

In spite of the absence of sugar in the urine, he believed that diabetes was the determining factor in the patient's death

JACKSONIAN EPILEPSY, TREPHINING, RECOVERY

DR W BARTON HOPKINS reported this case, stating that he did so for two reasons First, because it added one more to the list of epilepsies cured, at least temporarily, by the operation of trephining alone, in which no discoverable lesion had been found to exist, and, second, because he had employed for the first time on a living subject the trephine which he had devised and previously demonstrated on the cadaver before the Academy

T T, a man, aged twenty-one years, born in Italy, came to the Pennsylvania Hospital, July 15, 1903, with the following history Was naturally healthy until three years ago, when he became epileptic The condition was attributed to fright, while being lowered into a well he was suddenly impressed with a dread that he would fall, and became very much alarmed About one week afterwards he had his first convulsion At first these were occasional, but gradually increased in frequency, until of late he has had three or four a day On admission appears a healthy, well-nourished individual, of fair intelligence, examination of his urine, eye-grounds, chest, and abdomen are negative On the day of his admission he had three seizures, and during the night two One of the latter was described by the nurse as beginning

in the left upper extremity and involving the upper part of the body, was accompanied by unconsciousness, and during the attack the patient was very violent. During one of the seizures there was observed clonic movement at the elbow, then the head rotated to the left and the eyeballs turned upward and to the left. There were also some general bodily movements and apparently unconsciousness. There was no bleeding at the mouth. This seizure lasted about five minutes, at the end of which time the left arm was still twitching. Before recovering from the convulsion another similar one occurred, followed by still a third. The three seizures occupied about twenty minutes. The left arm was very painful afterwards. The nurse reported numerous convulsions up to midnight, when he was given a large dose of bromide of sodium, after which he slept.

The following observations were made by Dr. Charles K. Mills, who kindly saw the patient. Left upper extremity, some weakness in grip of hand and in special movements, as of little finger and thumb. Awkwardness with movement of left hand and fingers, especially with eyes closed, but all movements retained, all forms of sensation retained, response to touch prompt, but to pain and temperature diminished and retarded. Astereognosis of the left hand present, but not absolute, recognizes common objects, such as a knife, a coin or a key, by feeling them with his eyes closed, more promptly with the right hand and sometimes not at all with the left. Sensation similarly affected in the left lower extremity. There is no facial paralysis, no paralysis of the proximal portion of the arm and none of the lower extremities. Knee-jerk present on both sides, no plantar cutaneous reflex on the left except tarsal response at first. This latter may have been involuntary, tarsal and metatarsal responses on the right probably voluntary. No ankle clonus. Deep reflexes present in the upper extremities, probably more marked on the right.

July 23 the patient was anesthetized with anæsthon. The topographical lines were carefully pencilled with aniline, and a point for the centre of a three-inch flap was located about three-quarters of an inch posterior to the middle of the right Rolandic fissure. The time required in cutting and reflecting back the osteoplastic flap, after adjustment of the instrument, was six minutes. A good exposure of the dura mater was thus obtained.

The latter appeared perfectly healthy, pulsation was apparent to view and touch, and there was no abnormal tension. The dura was freely opened by a crucial incision, and a probe was inserted at one point into the cortex. A flat probe was also carefully insinuated between the brain and dura beneath the peripheral opening in the skull. No diseased area nor tumor being detected, the flap was replaced and the scalp approximated with a continuous catgut suture. The patient's condition was good throughout. The next day he had a slight convulsion, but otherwise was in satisfactory condition, and the grip of the left hand was found to have become very much stronger. His recovery from the operation was uneventful. Three weeks later, August 14, 1903, he was discharged from the hospital cured, the final note being made that his general condition was excellent, that he still complained of curious feelings on the palmar surface of the left wrist, that there was no anæsthesia of the hand, no asteriognosis, as tested with a knife and watch, and the grip of the left hand, which before the operation was very feeble, was about as strong as on the opposite side. Has been quite free from convulsions since the day after the operation. The patient, seen a month after his discharge, appeared to be in perfect health.

PANCREATIC CARCINOMA, GASTRO-ENTEROSTOMY, PECULIAR COURSE OF THE DUODENUM AND JEJUNUM

DR DE FOREST WILLARD reported the history of a woman, aged fifty-six years, who was admitted to the Medical Ward of the Presbyterian Hospital, October, 1903, under the care of Dr Stryker, with a history of indigestion for two years. She presented marked emaciation and deep jaundice, with increasing loss of flesh for last two months, loss probably twenty-five pounds. Continuous pain at and below epigastrium for four months, vomiting persistent, bowels constipated, fæces contain fat.

Diagnosis—Cancer, probably of pancreas, possibly involving stomach or gall-bladder. She was transferred to Surgical Ward for exploration and possible gastro-enterostomy, in order to drain the stomach. She was in exceedingly low condition deeply jaundiced.

On examination large dense nodulated masses were plainly palpable between the epigastrium and the umbilicus extending

along the spinal column nearly to the bifurcation of the aorta, and upward to the stomach, also extending across to the right in the direction of the gall-bladder. Aortic pulsations imparted to tumor. Left lobe of the liver not enlarged, but the liver is discoverable below the ribs. To the right was a smooth tumor of shape and feeling of an enlarged gall-bladder. Has vomited blood, dark in color. Has also sugar in the urine to the extent of 163 per cent, also bile pigments, albumen, and granular casts, faeces contain fat. The temperature was subnormal. Pain was very severe and the exhaustion great. There was no history of the violent attacks such as are found in cholelithiasis of the common duct.

Upon palpation the liver could be discovered below the ribs, but nodules could not be felt on its under surface. The gastric symptoms were not as positive as is usually the case in stomach cancer, there was less vomiting of blood. The absence of the pancreatic secretion from the intestines was not tested by giving salol and noting the absence or presence of its products carbolic and salicylic acids in the urine. salol under normal conditions should be decomposed into these two substances in the duodenum. Examination of the gastric contents showed free HCl present, total free HCl, 16, total acidity, 28, erythro-dextrin present, microscopic examination, starch.

Operation, October, 1903. Patient's condition very unfavorable, within fifteen minutes from beginning of operation pulse became unrecognizable at wrist. Patient in collapse throughout nearly whole time, salt solution, hypodermoclysis, oxygen, stimulants, etc., freely used. Upon opening the abdomen dense nodules occupying the site of the pancreas were reached. These nodules filled the curve of the duodenum, extended across to the left beyond the spinal column, and up and down the spine. Pylorus not involved. Liver free and normal. Gall-bladder greatly distended. The duodenum could be traced from the pylorus through the first three inches, then it disappeared behind the cancerous mass and could not be reached. On lifting the omentum, large dense masses were found adherent to the posterior part of the omentum, and, as the duodenum could not be reached nor the first part of the jejunum, a loop of bowel was caught and a posterior gastro-enterostomy done with a Murphy button, as the most rapid method. Patient's condition forebade any additional

entero-enterostomy The gall-bladder, the size of a small orange, was sutured to the abdominal wall and drained through a second opening Several ounces of very dark green, thin bile were secured, with four small dark gall-stones No stones found in ducts In spite of saline injections and stimulation of all kinds, the patient only rallied slightly, and died the night after operation

At autopsy the duodenum and the first part of the jejunum were entirely lost behind the cancerous pancreas Upon reflecting the great omentum the under surface was found adherent to the upper surface of the mesentery, still further concealing the course of the upper intestine A probe could be passed through the cystic and common ducts into the duodenum, meeting no obstruction The dilated gall-bladder and changes evidently had been due to pressure upon the duct The infiltrated glands extended up the spinal column as far as the diaphragm The left kidney showed secondary carcinoma deposits, liver and right kidney free

Pathological Diagnosis—Primary carcinoma of pancreas with metastases to the mesenteric, retroperitoneal, and peripancratic lymphatic glands, also of the left kidney Pressure on the duodenum and common bile duct, carcinomatous adhesions between the great omentum and mesentery enclosing transverse portion of the duodenum

Dr J Dutton Steele, Pathologist, reports as follows “ Carcinoma of pancreas, the organ considerably sclerosed, with atrophy of the secreting glandular tissue, cancer nests infiltrating the newly formed connective tissue Sclerosis does not affect the islands of Langerhans, and they are quite numerous in proportion to the glandular epithelium Cancer evidently of glandular origin The kidney shows secondary deposits, the acute parenchymatous degeneration or cloudy swelling as seen in cases of intoxication in poison and in malignant disease ”

DR WILLARD remarked that these tumors of the pancreas may sometimes be reached by dividing the gastrocolic omentum below the greater curvature, where the tumor may be covered by the posterior layer of the lesser sac, or they may be reached by turning up the omentum and tearing through the transverse mesocolon into the lesser sac, as they usually push the transverse colon downward, it is sometimes necessary to pass through both layers of peritoneum forming the greater omentum together with the posterior layer of the peritoneum of the lesser omentum

A dozen or more cases of attempted removals of cancer of the pancreas have been reported by Robson and Moynihan in their work on "Diseases of the Pancreas" Portions of the gland have certainly been safely taken away in some cases, and in one or two instances it is said the whole gland, but this procedure seems doubtful, especially when one considers the close relations of the large splenic, superior pancreaticoduodenal branches from the hepatic, and the inferior pancreaticoduodenal branches of the mesenteric The hæmorrhage from any one of these vessels in the already weakened condition of these patients would be a serious matter Directly behind the head also lies the inferior vena cava, the left renal vein and the aorta, to which vessels adhesions might have been contracted, while the tail of the organ is in intimate relation with the spleen and with the duodenojejunal flexure

SPINA BIFIDA, WITH ANTERIOR OPENING, FORMING ABDOMINAL CYST

DR DE FOREST WILLARD presented a female Italian child, who at his first examination, when the child was two months old, presented a dorsal tumor the size of a small orange, which occupied the whole lumbar region It was covered by normal skin, was semifluctuating in character, but was too dense to permit accurate information as to an opening into the spinal column The impression imparted to the hand was that of a lipoma, with an underlying spinal cyst Pressure upon the mass did not give the child pain nor apparent cerebral distress It was rendered somewhat tense in crying, but the child was apparently in no pain and did not cry out when handled The right half of the abdomen and flank were filled with a large semiliquid tumor, giving the impression of a sarcoma of the kidney The child does not use its lower limbs The baby at present is four months old, and observation for the last two months does not reveal any perceptible increase in either tumor, and the child is thriving, thus rendering the diagnosis of sarcoma improbable

The abdominal tumor bulges on coughing, is tympanitic in points, as though the colon was pushed forward, but with the possibility of it being an anterior spina bifida Tapping it has not been resorted to, and the condition is so uncertain that he had preferred to delay operative measures upon either posterior or

FIG. 1

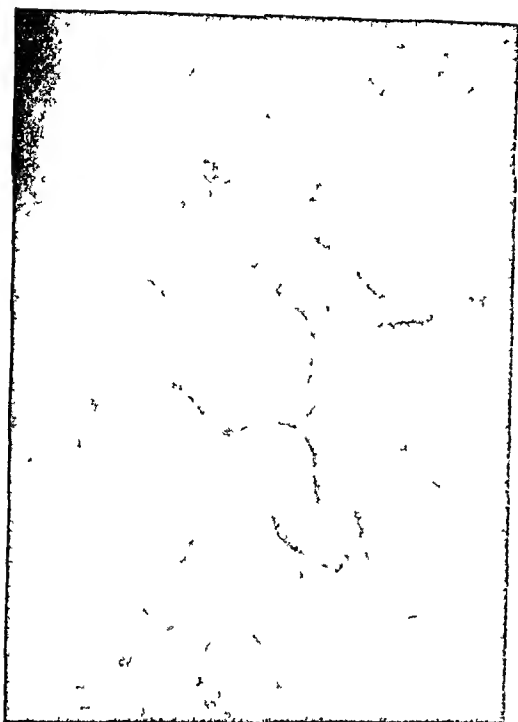


FIG. 2

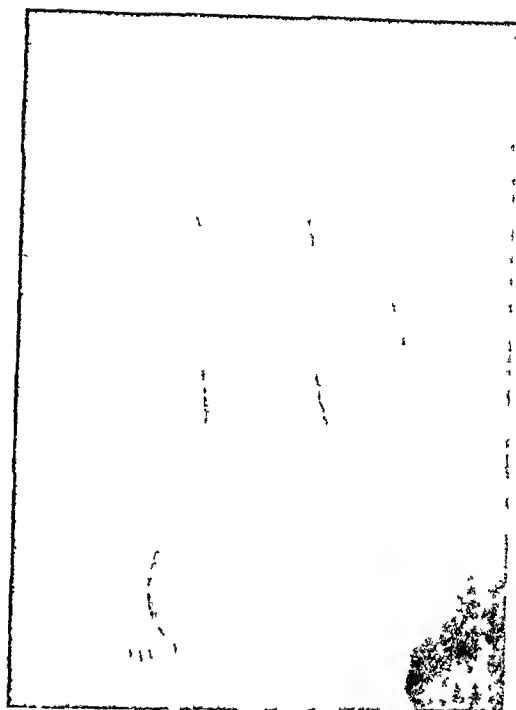
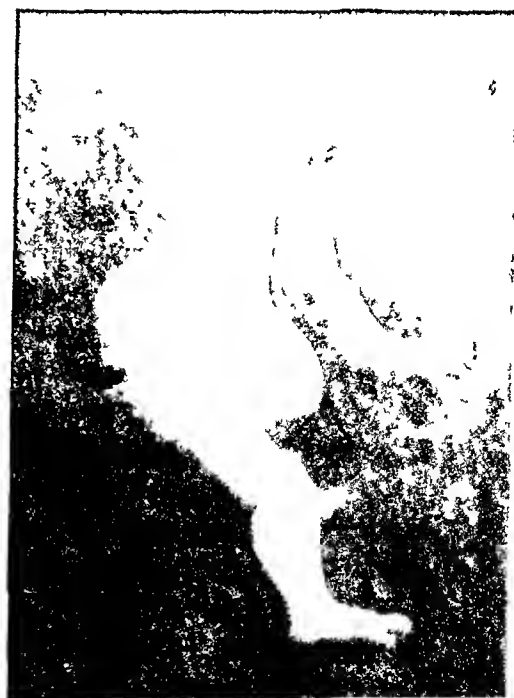


FIG. 3



FIG. 4



Spina bifida, posterior and anterior



FIG 5—Skirgraph of case of spina bifida, posterior and anterior

anterior tumors until the diagnosis was more sure, and until the child should be older

The dense shadow in the tumor, as seen in the skiagraph, denser even than the bones of the spinal column or pelvis, renders the condition a puzzling one. The tumor might be a teratoma containing foetal remains¹

Spina bifida anterior is a very rare condition². Robinson³ states that there is no clinical record of a similar experience to his own, but Emmett⁴ reports such a tumor diagnosed as an ovarian cyst in a woman of thirty-six years, which cyst extended into the pelvis, filled up the curve of the sacrum, and was aspirated through the rectum. The woman died on the seventh day. The cyst contained three quarts of fluid, and was found to be connected through the three lower sacral bones with the spinal canal.

In Robinson's case of a child of eleven months old with club-feet, there is no record of a posterior tumor, but the right side of the abdomen was occupied by a large tumor, which received an impulse on straining, the cutaneous veins were enlarged. The fingers could be dipped between the costal margin and the cyst. The diagnosis was that of a parovarian or broad ligament cyst, or some foetal remnant. Celiotomy was done at the right of the median line. A pint of fluid was removed from a thin-walled cyst, and a finger inserted into the cyst passed into an opening into the spinal column. The sac was ligatured close to the spine with silk and cut away. No nerves were found in the sac. The fluid was colorless, specific gravity, 1002, alkaline reaction, contained a trace of proteid and some chlorides. The child lived ten days. Temperature persistently high. Five days after operation the anterior fontanelle was fuller. No tetanic contractions in hands or arms. At the post-mortem an extensive defect at the right side of the last dorsal and of the lumbar vertebræ was discovered. The pedicles of the transverse processes of these vertebræ were absent, the bodies of the vertebræ were

¹ International Encyclopædia of Surgery, Ashhurst Vol. 11, pp. 902-905

² Willard International Encyclopædia of Surgery, Ashhurst, Vol. VII, Supplement, p. 653, 1895

³ Medical Press and Circular, London, p. 477, 1903. Transactions of Clinical Society London, 1903

⁴ American Journal of Obstetrics 1871 p. 623

irregular and fused The two lumbar had a very poorly formed ossific nucleus on its right half, the third had no ossific nucleus on the right side The spine was curved laterally, concavity to the left There was a marked dilatation of the central canal of the cord

One other case is found in the Royal College of Surgeons Museum,⁵ but there is no clinical record attached In this case there is a marked defect on the left side of the last lumbar vertebræ, but the case is probably one of posterior rather than anterior tumor

Bryant⁶ reports a case of a woman aged twenty-five years dying from an accident, who presented an anterior spina bifida

Jacobi⁷ reports operation upon a supposed lipoma in the lumbar region of a child four months old, which at birth presented a tumor the size of an English walnut It grew rapidly, however, and at the operation, after cutting through one and three-quarter inches of fat, a spinal sac the size of a thimble was found connecting with the two lower lumbar vertebræ The child died in convulsions in forty hours

Johnson⁸ reports a recovery from an excision of a fatty tumor overlying a spina bifida

DR JOHN B DEEVER said he believed the case to be one of spina bifida Both tumors contain fluid, as fluctuation can be elicited in each Both posterior and anterior are in connection with the spinal canal The paraplegia as well as the anterior tumor especially increasing in size when child cries favor this diagnosis

DR WILLIAM L RODMAN believed the tumor on the sacrum to be a combination of lipoma and spina bifida This is not a rare condition Dr Willard exhibited another such case to this Academy a year ago, and Dr Rodman has seen several such cases Bland-Sutton has particularly called attention to this condition The anterior tumor is of doubtful nature It is possible that the posterior one has become cut off from the spinal canal

⁵ Clinical Society, London, Spina Bifida Reports, Vol XVIII, pp 358, 359

⁶ London Pathological Society Transactions, Vol II, 1860, p 299

⁷ American Journal of Obstetrics, 1871, 631

⁸ Transactions of Pathological Society, London, Vol VIII, p 16

by closure of its communication and the fluid is going anteriorly. This seems to be a rational explanation of the situation, but the anterior tumor is tympanitic. The presence of coils of intestine might be in part responsible for this tympany, yet there seems more than would come from these and a moderately distended cyst. Another possibility in this case is that it may be one of lumbar hernia presenting in Petit's triangle. Spina bifida is usually accompanied by other developmental faults, such as hernia, talipes, hydrocephalus, etc. Dr Rodman was quite sure that the condition is not one of sarcoma of the kidney.

LIVER ABSCESS FOLLOWING AMÆBIC DYSENTERY, DRAINAGE THROUGH GASTROHEPATIC SPACE

DR DE FOREST WILLARD reported the history of a woman, sixty years of age, who in August, 1903, in the midst of good health, and without having visited the tropics, was seized at Atlantic City, New Jersey, with pain, mucous stools without blood, passages eight or ten daily, temperature as high as 104° F. Soreness on pressure continually present. Amœba found in stools. She was seen in consultation with Dr Musser late in September suffering with great pain over the region of the liver, with tenderness on pressure. Below and to the right of the epigastrium was a tender, semifluctuating tumor, visible to the eye. There was slight jaundice with continuous bowel pain and vomiting. Hæmoglobin, 60 per cent, red blood-corpuscles, 2,745,000, leucocytes, 22,000.

On account of danger of rupture into the peritoneal cavity, immediate operation advised, which was done September 29, 1903. (At the operation he was fortunate enough to have the assistance and counsel of Dr W J Mayo.)

Upon opening the peritoneum no adhesions were found between the two layers. The edge of the liver was plainly seen, but there were no signs of protruding abscess upon either upper or lower surfaces. Beneath the liver, in the gastrohepatic space, was a large elastic tumor, suggesting cyst of the pancreas. After circumferential packing had been introduced, a half-pint of greenish-yellow fluid was evacuated thin in consistency at first, later thicker and more glutinous, finally masses of dark broken-down liver tissue and partially organized coagula were discharged. In the cavity was a large ragged mass of firm consistency which

it was deemed unwise to detach with the fingers lest hæmorrhage be started. The walls of the abscess were stitched with catgut to the aponeurosis, and a large rubber drainage tube inserted to the bottom of the cavity, together with a strip of gauze.

Laboratory examination. Fluid from amœbic patient. Specific gravity 1002, albumen, $4\frac{4}{10}$ per cent, clear green fluid, no pancreatic ferments, no change in milk, and no production of peptone in alkaline media. Microscopical examination. No pus, few fat droplets and granular debris, no bacteria. Culture in agar (plate), sterile, no growth. Necrotic tissue, apparently old blood-clot, containing no amœba and no bacteria. The fluid proved to be sterile, did not respond to the tests for pancreatic juice, while it was also negative as regards bile tests. The hardened masses removed showed broken-down blood-corpuscles, etc.

As the patient vomited on fourth day, the packing was removed, lest its pressure upon the stomach might act as an irritant. The drainage from the cavity was left undisturbed. The peritoneal cavity was quickly blocked off and never became infected. The masses within the sac separated and came away as slough. Drainage continued for weeks from the cavity, which was six inches deep from the surface, but which slowly granulated.

October 4, 1903. Agglutination test with bacillus of dysentery in dilution, 1 to 20, negative. In dilution, 1 to 50, negative. Gastric contents, total amount, 58 cubic centimetres. Total free HCl, 0.4 cubic centimetre. $\frac{N}{10}$ NaOH Sol 0.014584 per cent. Lactic acid absent. Microscopic fat globules abundant, starch granules few, sarcinæ absent, Oppler Boas bacilli negative.

October 5, 1903. Hæmoglobin, 75 per cent, red blood-corpuscles, 4,238,000, leucocytes, 14,900. Gauze dressings suggestive of biliary elements, staphylococcus pyogenes albus.

October 30, 1903. Amœba coli present in the abdominal discharge and in stools.

The varying conditions of the presence or absence of amœba agree with the statement of Kieffer (*Philadelphia Medical Journal*, February 21 and 28, 1903) in his excellent lectures on "Tropical Abscess of the Liver."

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

*Joint Meeting with the Chicago Medical Society, held January
13, 1904*

The President, E WYLLYS ANDREWS, in the Chair

THE SURGICAL TREATMENT OF BRIGHT'S DISEASE

DR E WYLLYS ANDREWS reported four cases, as follows
First, a man, thirty-two years of age, in moderate health otherwise, who had had for some years chronic interstitial nephritis His urea averaged about $7/10$ per cent There were hyaline casts Double decapsulation was performed, following which there was a decided improvement in the total amount of urine as well as the total solids, and for a period of two or three weeks thereafter the urea went above 1 per cent, and remained between 1 and 2 per cent, while the casts were about the same There was a small amount of albumen The subsequent history was that the urea was again reduced There were two or threescore careful urinalyses made of twenty-four hour specimens The case was watched carefully, and to the best of his knowledge, nearly eighteen months after the operation, there was very little change for the better, nor yet was the patient much worse

The second case was a young man, twenty-seven years of age, in comparatively good health A patient of Dr Johnson Careful urinalyses showed that he had constantly averaged only $1/2$ per cent urea, moderate amount of casts, and had chronic interstitial nephritis Last May or June he decapsulated the kidneys, and, as in the first case, a very promising result appeared to be obtained at first The urea line went up above 1 per cent, sometimes 2 per cent and stood there for a little while, but the speaker was much disappointed to learn some months afterwards

that patient's urea had dropped again to the old per cent. The man had been six months before, and six or eight months after, the operation constantly on the strictest diet. While the patient reported himself as robust and feeling well, as a matter of fact his urinary findings were about the same.

Case three was under the charge of Dr. Goodkind and Dr. Hunt, of Englewood. A child, nine years of age, had severe, well-advanced chronic parenchymatous nephritis. The patient had been watched for some years, the symptoms had slowly but progressively grown worse. Anasarca was extreme, his eyes, forehead, neck, and chest were markedly cedematous as well as the lower limbs. Albumen varied from $\frac{1}{2}$ to $2\frac{1}{2}$ per cent, urine rather scanty, and the case was apparently a desperate one, although there was never any bad heart action, or there had never been any coma. The child's condition precluded general anæsthesia with ether or chloroform. Under spinal cocainization, however, he had no difficulty whatever in making the decapsulation. The operation was done in September. A slightly favorable influence was at first apparent, the albumen diminished in quantity, remaining at about 1 per cent, casts remained numerous, urea was fairly good, there was never at any time the slightest improvement in the anasarca. Patient remained in the hospital three or four weeks, then went home. After the fourth week the albumen again increased in quantity. After five weeks the patient had the former amount of albumen and, if anything, a smaller quantity of urine. He was dropsical and could hardly be moved. He considered it a case not improved by the method.

In case four the operation was done two months ago. It was a mixed case of intermittent hydronephrosis and unilateral nephritis. There was relief from all of the kidney symptoms by combined nephropexy and complete decortication of one kidney. Formerly, the urine was frequently full of blood, with a good many casts in the urine. There was intermittent distention and pain, and albuminuria, all of which symptoms had been entirely relieved, but he should say that it was likely the nephropexy, and not the decortication, that did the work.

DR. L. L. McARTHUR reported the following case of double decapsulation of kidney in a woman aged twenty-five years.

During an attack of pleurisy in August, 1901, she was found

to be suffering from nephritis Ever since she has been under rigid medical care by Dr Favill, and has had full benefit of diet, hygiene, and change of climate She was referred to Dr L L McArthur, for surgical treatment, in September, 1902, complaining of pain in back of head, œdema about eyes, ankles, and hands, infrequent urination (at times but once in two days), loss of appetite, strength, and weight, and attacks of drowsiness

She had œdema of face about eyes of moderate degree, also about ankles and hands Some pallor and "looked" weak and sick No abnormal retinal findings Condition of urine, color, straw, reaction, acid, sp gr 1007-1014, sediment, small amount, amount in twenty-four hours, 750-1700 cubic centimetres (Amount due to large amount of water ingested, average, 1080 Much less (twenty ounces) before water was crowded,) total solids, 16.3 to 26.7, urea, 1 to 2.4 per cent, albumen, 1 to 1.2 per cent, sugar, 0, pus, few to much, blood 0 to few, cells, many epithelial, crystals, few calcium oxalate, urates, casts, few granular, few hyaline (Only one specimen had none)

September 29, 1902 Decapsulation of right kidney was done through an oblique lumbar incision The capsule was somewhat adherent and the kidney slightly contracted Capsule divided transversely, and then the lower and upper poles were respectively delivered, so that the whole capsule was placed anterior and internal to the kidney, and acted as a shelf upon which the kidney rested The lower half capsule was stitched to fascia of transversalis at edge of wound by three catgut sutures Temporary small drainage tube down to kidney Recovery from operation was uneventful

Segregation after first operation showed

1 Amount of urine always more (one exception) from right kidney 2 Urea, in three analyses more from right side, in two analyses same amount from both sides, in two analyses less than in left side 3 Albumen in four analyses much more from left kidney in two analyses same from both sides 4 Casts, in one analysis no casts from right, few granular from left, in one analysis no casts from either side in one analysis few granular right few granular left no hyaline right, few hyaline left in one analysis one granular right few granular left, one pus right casts left

General condition after right kidney had been operated upon
Decreased pain, no œdema, larger amount of urine, appetite still poor, some increase in strength

Urine analyses before first operation compared with analysis after both kidneys had been decorticated

Before (Nine Analyses)

After (Ten Analyses)

Specific gravity, 1007 to 1014

Average, 1011

* Amount in twenty-four hours, average, 1080 cubic centimetres

Average, 1187 (1320 to 1800 last six months)

Total solids, 16.31 to 26.7 grammes

Risen to 36 grammes last six months

Urea, average, 1.45 per cent

Average, 1.42 per cent

Albumen, average, 4 per cent

Whole average, 1.6 grammes, but when not including two examinations in February, which were 3.2 and 4.0, average was 1.02 grammes

Sugar, 0

0

Pus, few to much

Very few

Blood, 0 to few

Few to 0

Cells, many epithelial

Still many, at times few

Crystals, 0 to few oxalate

Amorphous few

Casts, always some granular, usually few. Few or considerable hyaline

Have diminished from few granules and many hyaline to 1 granule and 4 hyaline in three specimens during last six months

January 1, 1903 The left kidney was decorticated at the urgent request of patient. Same technique. Appearance of kidney negative. Left hospital, March 5, 1903

Comparative analysis of symptoms

Before Operation

To-day

Pain in back and head at times severe

No pain

œdema of face and eyes, ankles and hands

No œdema (Rarely slight above eyes)

Loss of weight

Some gain in weight

Great loss of strength

Great gain in strength

At times would urinate but once a day or day and a half, total 20 ounces or less

Urinate five or six times during day, 60 ounces last twenty-four hours

* Much less before entering hospital, where liquids were abundantly crowded

Before Operation

Drowsiness at times marked
Very tired upon the least exertion
Appetite very poor

To-day

No drowsiness
Exercises freely and feels "perfectly well"
Appetite good (Still on a diet of no meats)
'I am perfectly well now, and wish to go back to my work'

NOTE—Cardiovascular changes as to blood-pressure, etc., not accurately enough noted to draw conclusions

Final Conclusions applying to this Case—(1) General condition much improved since operative interference. The element of time and two periods of absolute rest in bed for two weeks each must be considered here as possible causative factors, while on the other hand, be it noted, the patient for over a year before operations was under excellent medical care and given full benefit of diet, hygiene, and change of climate

(2) Distinct improvement in the quality and quantity of the urine secreted from the kidney first operated upon as compared with the unoperated kidney

(3) Improvement in quality and quantity of urine from both kidneys since the operation

DR A J OCHSNER said we must look upon cases of nephritis as forming two distinct classes which had nothing to do with each other, so far as the disease itself was concerned, with the exception of certain symptoms. In the one class we had healthy kidneys, one of which had been injured mechanically, and this injury having been corrected by fixation and decapsulation, the kidney itself contained the elements which were necessary for its recovery. This class was discussed by Edebohls in his first paper.

In the other class, with systemic cause or causes, the conditions were entirely different. The element of tension might depend upon a further condition which was not mentioned, namely, œdema of the kidney. Tension in these kidneys was increased to a great extent in advanced cases by the œdematous condition of the kidney itself, and after relieving tension there was at once a flow of œdematous fluid precisely the same as was found in cutting through the remaining œdematous tissues. Having relieved the œdema, it was easy to imagine that the kidney tissues would be relieved of a certain burden, and the tissues which were prac-

tically inactive before would become active again, in a measure, for a short period. But these kidneys did not possess the conditions which were necessary for permanent recovery.

He had operated on a large number of movable kidneys in which there had been an injury due to displacement, interference with the circulation and traumatism, which accompanied this condition in which he removed a portion of the capsule for the purpose of securing proper fixation. He believed that these kidneys need not be considered, because the results, so far as nephritis was concerned, were simply incidental. The patient would live probably nearly as long, if not quite as long, with the use of one good kidney, the injury to the movable kidney being of slight importance.

As regards patients suffering from advanced nephritis, he had operated on seven cases, all but one of which seemed hopeless. All but one of these had well-marked albuminuric retinitis. One of these was a man, fifty-one years of age, an alcoholic, with a tremendous general oedema, and having all of the symptoms of advanced interstitial nephritis. He operated upon him August 3, 1903. Patient had been comatose a portion of the time for several days. He had been under careful medical treatment during a period of six months. The six weeks before the operation were spent under observation and treatment in the hospital. The oedema disappeared completely and the patient improved to a marked degree. The amount of urine increased from an average of fourteen ounces in twenty-four hours to over sixty ounces. The cause of his nephritis was chronic alcoholism. Patient was still alive, he had resumed his habits as regards the use of alcohol, and was now suffering from a mild form of mania. He thought he would die soon. There was one case which corresponded closely to the one Dr. McArthur had described, the patient being only thirty-six years of age. She was operated on June 26, 1903, and at the present time patient claimed to be perfectly well. Four out of seven had died within one year after the operation, one of them within two weeks. One improved materially after operation upon one kidney, and expressed a desire to have the other kidney operated on, but he died in seven days from acute uræmia. Three were alive, one of them having been operated on only a few weeks ago.

DR. ALEXANDER HUGH FERGUSON said that in the milder

cases of nephritis the results of decapsulation were beautiful, both immediate and permanent

Surgeons, however, had been forced to operate on many severe cases since this surgical procedure had been devised. Cases that were moribund were bound to die inside of a few days or weeks, they slipped away from the internists, who could not do anything more for them. Decapsulation, he thought, had more effect upon patients than internal medication. However, he would say that the limitations of decortication of the kidney were not yet clearly defined. At the present time, with an experience of over twenty operated cases, he would put down the indications for surgical intervention in Bright's disease as follows. Independently of this, he would decapsulate all cases of floating kidney, and suspend such a kidney from the peeled-off capsule. The reason for this being that in a number of cases that had been under observation for years there had been no kidney disturbance other than that the kidney might be movable, and after a time the kidney became painful and tender, with symptoms of Bright's disease, as indicated by the condition of the urine. He had made inquiries of thirteen different such cases he had on his books, extending over a period of years, and of this number that were operated upon for kidney disturbances since they had been his patients, all but three had undergone nephropexy, pointing out the fact that the kidney having once lost its moorings, interference with the circulation thereby produced a low form of inflammation in the kidney, which called for surgical treatment. He had years ago refused to operate upon cases of floating kidneys because there was Bright's disease as well. Now, it was an indication for operating. An indication would be for nephritis itself. The first of these would be acute Bright's disease of whatever form, where it stubbornly refused management, as in those cases attacked by Reginald Harrison for the relief of kidney tension. Although Harrison had operated on some of them under mistaken diagnoses, still the lesson was taught the profession that acute Bright's disease was amenable to surgical treatment. We might have the diffuse, interstitial and parenchymatous forms of acute Bright's disease. One could not in a given case tell, without microscopic examination, how much was parenchymatous, how much was interstitial, and how much was diffuse. Cases of chronic interstitial nephritis in which the kidneys were extremely painful and tender, though

small, were benefited for a time, at least, by decapsulation and puncture. It could not be said that peeling off of the capsule of the kidney was going to cure general arteriosclerosis, but it might affect the sclerosis in that kidney. Parenchymatous nephritis was a form, he thought at one time, which would receive no benefit by operation, but he was convinced to the contrary in properly selected cases. He mentioned three extreme cases showing the limitations of the operation.

Last June he was called to Wheaton, Illinois, to see a man, fifty-six years of age, who had been ill for twenty days. He went to Wisconsin on a business trip, took cold in driving through the country, his urine became bloody, he returned in three days, and placed himself under his physician. Several months before this illness the patient's urine was examined repeatedly at the Columbus Medical Laboratory without finding evidence of Bright's disease. It was also examined by a physician who had examined the man for life insurance. Dr. Rea examined his urine several times, and he could not find any evidence of Bright's disease. For six days before he had only passed eight ounces of urine. He had been perspiring profusely. He had œdema of the lungs, bloated face, was drowsy, and one would have to arouse him before he would answer questions. It was an extreme case, one which he thought ought not to be operated upon. He consented to explore one kidney under local anæsthesia. He used cocaine, explored the right kidney, and found, when he began to handle the kidney, it caused pain. A little chloroform was given the patient as an analgesic rather than for the purpose of putting him profoundly asleep. In peeling off the capsule, the first appearance of such a kidney was its dark-blue color, and blistered. The capsule was completely raised off over two-thirds of the kidney. There was bloody serum underneath. The capsule peeled off readily. The kidney itself was hard, mottled, and friable. This was a case, as shown by a microscopic examination of a portion of the kidney, of acute, diffuse, hæmorrhagic nephritis engrafted upon an old interstitial Bright's disease. If this case had been operated on early, he believed life would have been spared for some time. He died of pulmonary œdema in sixteen hours.

The next case was one of double decapsulation of the kidney, the operation having been performed November 23 last. Patient was a week in the hospital before the operation. He had ad-

vanced interstitial nephritis This patient had marked headache, œdema of the face, arms, and legs The urine, sp gr 1007, was loaded with granular and hyaline casts, albumen, 36 per cent, urea, $\frac{3}{4}$ of 1 per cent, with pus coming from the bladder and prostate He had coma two weeks before the operation, and he was unconscious for three or four hours After the operation the clinical picture in this case was changed completely Instead of being stupid, drowsy, bloated, œdematous, and a half-living man, he appeared to be wide awake, sprightly, and walked into the clinic, three weeks afterwards, with the record of his case under his arm to show himself When the speaker saw the patient three weeks ago he was improving constitutionally There was not much change in the urine, with the exception that there was less albumen, granular casts were present and were as abundant as before The quantity of urine was somewhat less, but not sufficient to say much about it The fundus of each eye was extremely congested before operation, so that he could not distinguish his relatives from the nurse He could not see to read at all In a few days vision had improved amazingly He discarded his spectacles and could read readily and well What the permanent benefit would be in this case he did not know

Another patient had had Bright's disease He had scarlet fever twelve years previously, and Bright's disease was only diagnosed by a physician about nine months ago He told patient that his case was hopeless Patient was passing very little urine He had general œdema A rapid operation was done, and two white kidneys about the size of an egg were found In cutting into them they did not bleed, it was just like cutting into a piece of cheese Nothing surgically could be done which would be of benefit in these cases of small white kidney

He operated upon a woman on the 9th of September, 1897, who was referred to him by Dr E M Brown He saw her a month ago He sent her to the hospital and had repeated examinations of her urine made She secreted more urine now than normally, but there were no casts to be found in it The case was one of interstitial nephritis, with double floating kidney This case was interesting because the right floating kidney had been anchored before, but it did not relieve the pain Decapsulation of the kidney and anchoring it by the capsule caused relief The patient was healthier now than she had been for many years

He mentioned the case of a man upon whom he operated for parenchymatous nephritis in August, 1902. The improvement in this case since operation had been very satisfactory. He had over 50 per cent of albumen in the urine, which could not be reduced by changing climate and by medication and nursing, but double decapsulation reduced it to one-half of 1 per cent. What the remote result would be, he did not know.

Referring to the mortality, he said it was not fair to say that when a surgeon operated on a case of Bright's disease and decapsulated the kidney, if the patient lived for a month and then died, death was due to the operation. It was unfair to say that the mortality from decapsulation of the kidney was 100 per cent, 50 per cent, or even 15 per cent, because one should reckon from the operation *per se*. If a man should die afterwards from Bright's disease, he did not die from the operation. It should be simply stated that the operation did not cure him. The mortality to-day from renal decapsulation was in the neighborhood of 6 per cent *per se*. As to how the improvement took place it was not known.

As to the formation of a new fibrous capsule, the speaker pointed out that we had two kinds of fibrous tissue produced by repair, one of which went on to cicatrization, with an increase in quantity, and the other behaved quite the reverse, as the patient became older the fibrous scar became less and less, until eventually it were hardly recognized. It is not yet proved whether the new fibrous capsule increases in bulk or not.

He was of the opinion that an anastomosis took place between the outside of the kidney and the newly-formed capsule. We had evidence of fibrous adhesions in other parts of the body becoming vascular, such as within the abdominal cavity and thorax. He had had one case with which he could demonstrate that. He had operated twice. The second time he opened the kidney and removed a section of the adherent new cortex of the kidney, and this was quite vascular. To prove this point would require a great deal of experimentation and observation.

The marked primary benefit he thought was due to the great determination of blood to the part, instituting a new order of things in chronic cases, and the relief of tension in acute ones. He believed, also, that puncturing or opening these kidneys, when they were considerably diseased, would prevent anuria. He had observed in the literature that one or two cases died from anuria.

If such a kidney were partly opened, the urine would escape on to the dressing, and it would prevent death from that cause. Relief of tension did not pertain so much to the chronic as it did to the acute cases.

DR EMIL RIES said he was in a position to furnish information along the line of experimentation referred to by Dr. Ferguson, inasmuch as he (Ferguson) had mentioned the experiments of Albarran and his school as being unsatisfactory to the surgeon because they were performed on dogs, which did not have nephritis. He mentioned the case of a man, forty-four years of age, who had had hæmaturia. Patient had been treated for five weeks by medical men, and with the cystoscope it was determined that the blood came from the left kidney exclusively.

Remembering the excellent results obtained in cases of hæmaturia by numerous surgeons, first of all by Reginald Harrison and Israel, of Berlin, operation was advised. It was performed on the 8th of August, 1901. On the 11th the urine was clear, and remained so. The patient made a smooth recovery. In August of the same year patient had hæmaturia again (slight) for two months, and when admitted to the hospital it was considerable. Patient was pale, weak, and unable to work. Cystoscope again showed blood escaping from the left ureter and clear urine escaping from the right ureter, so that the presence of the right kidney was known. He advised patient to have the left kidney removed entirely, which was acceded to, and the organ was removed. The newly-formed capsule around the kidney was about as thick as one's little finger, and very firmly attached all around, so that it would have been difficult to remove the kidney with the capsule, but it was easy to detach the capsule from the kidney itself and remove the kidney. From the kidney removed over 600 sections were made. He had stained and examined every one of these sections, and among the 600 sections there was but one single anastomosis, and this anastomosis was near a strip of connective tissue which followed the path made by him in the first operation with his finger, which he inserted into the pelvis of the kidney. Even this was not a direct anastomosis of kidney tissue, but was a vessel in the scar tissue. In the rest of the sections examined there was not a single, solitary anastomosis. The 600 sections were taken from various parts of the kidney, and this experiment, if one wished to call it such, on the human being

proved conclusively that the theory of the *modus operandi* of this operation, to wit, that it was due to anastomoses forming, was incorrect. He wished to say, however, that the fact that the theory of the treatment was incorrect did not prove that the treatment was incorrect, or that the treatment was unsuccessful. It was not clearly known how mercury cured syphilis, nor how quinine cured malaria. Nevertheless, these are two generally used and successful methods of treatment. That the theory of the formation of anastomoses after renal decapsulation was wrong was not for the first time demonstrated on the human being in this case. A specimen of the same kind was demonstrated at the New Orleans meeting of the American Medical Association, and a report published in the Journal of the Association. In that case, too, no anastomoses were found.

The speaker had operated on five cases. Two did not live more than seven months. Both were advanced cases, in both there were findings in the fundus, hæmorrhages in the vitreous and retina. Two cases were decapsulated for hæmaturia, one in 1899, which was successful. The patient was alive and perfectly well to-day. He was over sixty years of age.

The second case was the one whose kidney tissue he had shown. He had operated on one woman with a floating kidney, with traces of albumen in the urine from time to time. There were occasionally hyaline casts. As he had to operate for floating kidney, he decapsulated the organ to a greater extent than he usually did in these cases, using the capsule for suspending the kidney. This woman was well. She was operated on a year and nine months ago. He saw her about six weeks ago, at which time she was in good health. There was no albumen in the urine at that time. But that did not prove very much, as the albumen had not been present constantly before the operation, either.

He was sceptical as to the results of this operation. Taking it altogether, including his two cases of hæmaturia, one of which was relieved for seven months, it confirmed what had been known for years. Operation did not improve the prognosis in those cases in which there was disturbance in the fundus. In cases of floating kidney, with the presence of albumen in the urine, improvement seemed to follow operation with decapsulation to a greater extent than without it, but as a treatment for chronic interstitial nephritis, he would never advise the operation. In the cases he had

operated upon he had not advised the operation either, except in hæmaturia cases. In the cases in which there were findings in the fundus, he would now advise against operation. His patients had heard of such operations, and had consulted him in regard to whether anything could be expected from it, and he told the patients that it was a matter of experiment. If the patient wanted that experiment tried, he was willing to undertake it. With such an understanding he was willing to operate. He did not believe at the time he operated on these cases, nor did he believe to-day, that any definite promise could be held out.

DR ARTHUR DEAN BEVAN said that if it were not for the fact that Dr. Ferguson claimed to be the originator of renal decapsulation, he should call it the gynecological treatment of Bright's disease. He had read Edebohl's first paper long before he heard of Ferguson's claim. Edebohl's operation was in line with the work of the gynecologist who, in the ordinary cases which came to him complaining of trouble in the pelvis, backache, etc., employed as a routine treatment curettement of the uterus, sewing up of the lacerated cervix, and then sewing up the lacerated perineum. Finding, however, that many of the patients did not get well from this treatment he added to these measures fixation of the uterus as a routine. Even then many of the patients did not fully recover. He then added, as a routine, removal of the appendix at the time fixation of the uterus was undertaken, so that the house that Jack built read something like this: Curettement of the uterus, repair of the lacerated cervix, repair of the lacerated perineum, fixation of the uterus, and removal of the appendix. Finding that more of his patients recovered after this last procedure than before, but still there were some who were not benefited, he then added as a routine fixation of the right kidney. All of these operations were done at the same sitting, and all of the patients got well with the exception of those who had Bright's disease and these he cured by fixation of the kidney and stripping of the capsule.

The speaker did not think renal decapsulation could be said to be the surgical treatment of Bright's disease, because as a matter of fact, the great majority of surgeons throughout the United States and of the world had never accepted the operation as being a logical procedure. He ventured to say that nine-tenths of the surgeons who were members of the American Surgical

Association had not accepted renal decapsulation as a logical operative procedure. He did not think, therefore, it was strictly fair to call surgeons to account because this treatment was a failure. He thought credit should be given to Drs Edebohls, Ferguson, and others for working out the problem. However, he thought the time had come when the profession could safely say that stripping off the capsule as a treatment for Bright's disease was a complete and perfect failure, and should receive the stamp of disapproval of scientific men. Out of this work had come some good, because it emphasized the importance of a class of cases in which another line of treatment was of value, namely, in cases of anuria, cases of essential kidney hæmaturia, in chronic pyelitis, with some nephritis, draining the kidney by a rapid nephrotomy was of distinct value. It had effected a great many cures, and would accomplish more. There were certain cases which came under the head of essential kidney hæmorrhage, and cases of pyelitis, with some nephritic involvement, which were difficult to differentiate sometimes by the most expert internist and diagnostician from Bright's disease, in which drainage of the pelvis of the kidney was of distinct value. But stripping off the capsule for the cure of Bright's disease was of very little, if any, value, and it now only remained for the profession to convince Ferguson, Edebohls, and others of this fact.

REVIEWS OF BOOKS

DISEASES OF THE ANUS, RECTUM, AND PELVIC COLON By JAMES P TUTTLE, A M , M D , Professor of Rectal Surgery in the New York Polyclinic Medical School New York D Appleton & Co , 1903

This work appears to be one of the most complete, exhaustive, and thorough presented for the aid and instruction of the rectal specialist

The chapters on Embryology, Anatomy, Physiology, and Malformations are full and accurate, that on Examination and Diagnosis being replete with valuable suggestions

The author's handling of the subjects of Proctitis, and Catarrhal Diseases of the Sigmoid and Colon, leaves little to be desired

The chapter on Tuberculosis of Rectum and Colon seems to the writer the most complete to be found in any modern work of the kind Allingham, Kelsey, and Mathews give the subject but scant mention The same is true of Gant in his recent work

In Fissure in Ano the author describes a method of treatment, by repeated applications of pure ichthyol following insufflation of orthoform, by which means he claims a large percentage of cures in uncomplicated cases This method seems worthy of fuller trial

In operative procedure he indicates three methods,—dilatation, incision, and excision, and he seems, in the main, to favor incision because, as claimed, it is more certain to cure, and obviates the necessity of a general anæsthetic In this he agrees with Kelsey The writer would dissent from this conclusion, agreeing most decidedly with Mathews in favoring dilatation because the operation is less formidable, the relief, in nearly all cases, very prompt, the healing speedy, and the patient seldom laid up more

than one day, which is a great consideration. If the sentinel pile is removed, and overhanging edges paired if they exist, failure seldom results. The matter of general anæsthesia may be a point against divulsion. The writer has met this by using in over 800 cases nitrous oxide, which has answered the purpose admirably, and which the patients take with but slight inconvenience.

On the other hand, incision, unless deep enough to divide the sphincter, often fails, Dupuytren, Curling, and Copeland to the contrary notwithstanding, and when thus deep, makes a wound difficult to keep aseptic, which heals slowly, and in most cases means detention from avocation for some time.

The author's treatment of the subjects of Perianal and Perirectal Abscesses and Fistula is very full and explicit. The delineations of technique, methods of operation, and subsequent treatment, are admirable, and the indications pointed out in favor of excision with immediate suturing, in selected cases of fistula, worthy of fullest consideration.

In the matter of treatment of hæmorrhoids, this work may almost be said to mark a new departure, in that the author, differing from Allingham, Mathews, Gant, and from the present attitude of Kelsey, gives his unqualified endorsement to the usefulness of the injection method for the treatment of uncomplicated cases of internal hæmorrhoids.

His dissent from the almost universal chorus of condemnation by the standard authors is marked by a careful discrimination between the two systems in vogue, *viz*, the one which injects strong solutions in large quantities, thus causing sloughing of the tumors, and the one which uses small quantities of weak solutions, producing mild inflammation, induration, and final atrophy of the pile, without ulceration or sloughing.

The former he emphatically, and justly, condemns, the latter he endorses. Yet this first method is the one generally indicated and described by the authorities as the injection method, and its evil results pointed out.

For instance, Gant, in his recent work, gives as an illustrative case a patient who would not submit to an operation, whom he treated thus. Four tumors were injected at once with a moderately strong carbolic solution, ten minims to each tumor. On the tenth day, two tumors remaining were well treated in the same manner. Result, great pain, inflammation, sloughing, and abscess.

A practitioner experienced in this method would expect nothing else. The error is in the excess of fluid injected, overfilling the tumors, and extending the inflammation to the surrounding cellular tissue, and in treating too many tumors at once.

The experience of the writer, in a large number of cases treated by the milder method, leads him to almost adopt the identical conclusions of Professor Tuttle.

This method is not to be heralded as a universal substitute for the more radical and effective operations of ligature, clamp, and cautery, but there are multitudes of cases, when wisely selected, in which it will give very satisfactory cures, with a minimum of inconvenience, and no detention from ordinary duties.

The attitude of the profession must change in this regard, and this work will mark a step in the right direction.

The author's criticism of the modification of Whitehead's operation, introduced by Pratt, of Chicago, seems fully justified by several cases which have come under observation, where the results were very unsatisfactory.

The criticism of the Allingham and Vanburen method of cauterizing the mass in prolapse of the rectum with nitric acid or actual cautery is noted with satisfaction, as also the recommendation of the removal of sections of the membrane by clamp and cautery, as giving better guarantee of success.

The chapters on Malignant Neoplasms and Excision of the Rectum are replete with valuable information, and the large number of cases gathered and tabulated very instructive. The facts point to, and seem to bear out, the conclusions of the author, that early excision of the rectum, in judiciously selected cases,

not only offers a hope of prolonged life, but in a small per cent of these unfortunate cases does give promise of permanent cure

To counterbalance this, however, is the ominous death-rate of about 20 per cent, which the best aseptic technique has not been able to materially reduce. But when we consider that the lives thus shortened were doomed without surgical interference, the balance still seems to be in favor of the author's conclusion, when action is tempered with wise conservatism

The author's treatment of colostomy, his careful differentiation of methods, and the conditions requiring the temporary or permanent operations are admirable

It would seem that the limitations he suggests as to the usefulness of Colostomy in malignant cases of the rectum are justified, and that the attitude of certain surgeons, who seem to be ready to perform Colostomy on nearly all cases where excision is not admissible, in no sense commends itself to the conservative mind

J RUSSELL TABER

GYNÆCOLOGY A Text-Book for Students and a Guide for Practitioners By WILLIAM R PRYOR, M D, Professor of Gynæcology, New York Polyclinic Medical School, etc. Octavo, 373 pp, 163 illustrations. New York D Appleton & Co

The author of this work has given us a concise treatise upon those subjects which are strictly gynæcological, and which are commonly met with in private practice. Few rare diseases are described or illustrated, and no space is sacrificed to bibliography, minute anatomy or microscopy which are of little interest to the general reader. The reviewer can but congratulate Dr Pryor on his selections and upon the general arrangement of this readable book

Dr Pryor's large experience as a teacher, his power to enthuse his auditors, and his positiveness, carry conviction, and

make the book of particular value as a guide to the general practitioner, who will find many excellent and explicit suggestions in the various chapters

The work is divided into two parts. In the first, those diseases peculiar to women are clearly and concisely described, and the text elucidated with illustrations of more than ordinary merit. The second part of the book is devoted to a description of the various gynæcological operations, and a consideration of the indications and the contraindications for the same. The details of technique in both local and operative treatment of the various pelvic disorders are specially dwelt upon.

The chapters on pelvic inflammations are noteworthy, gonococcic and septic infections have received much attention, and the general subject of peritonitis is dealt with in such a thorough and practical manner that both student and surgeon will find it interesting and suggestive.

The sections on diseases of the urethra and bladder are replete with practical suggestions as to diagnosis and treatment, and merit commendation. The surgery of the perineum and cervix are well described, and the operations on these structures made clear by numerous, well-executed illustrations. One can hardly see reason for the author's strong advocacy of silver wire in plastic work, when chronic, tendon, and silkworm gut will give the desired results.

The chapters on ovarian and uterine neoplasms and cancer are interesting, these subjects are thoroughly, though not exhaustively, considered, the pathology of the latter disease is well illustrated, and the indications and limitations for operative intervention are definite.

The author's ideas on drainage after abdominal operation, and his general rules for its employment or avoidance, are based on sound logic, and will be read with profit.

Dr Pryor we find at his best in his description of vaginal hysterectomy with hemisection of the uterus for pelvic suppura-

tion, this original chapter contains much that will be helpful to every gynæcological surgeon. The pages on the preparation of the patient for major operations and her post-operative management are of special value to the occasional operator, who is in need of explicit directions as to the proper care of his case.

There can be little doubt that the author favors vaginal operations when intrapelvic conditions make the vaginal route possible, however, he differentiates with skill the conditions to which it is applicable, and discusses the advantages of the abdominal operation without bias.

The work as a whole is interesting, original, scientific, and will be found to be a most practical aid to the student as well as to the finished surgeon.

JOHN O. POLAK

DISEASES OF THE EAR. A Text-Book for Practitioners and Students of Medicine. By EDWARD BRADFORD DENCH, PH D, M D, Professor of Otology in the University and Bellevue Hospital Medical College. Third Edition, Revised. New York: D. Appleton & Co.

This treatise has already gained for itself a place of honor among the many books that have recently been appearing in this special field of work. The issue of a new and revised edition (third) of it speaks well for its character. The constituency for such a work is growing, but the work must have intrinsic worth to hold the constituency. This we concede it has.

The author adopts a style all his own. We are not often impressed with its like. It has a certain dignity of cadence, an *ex cathedra* quality of utterance, that reminds one of the lecturer proceeding with measured sentence and repelling querulous interruption.

This is impressive and takes with the general reader, who likes what is authoritative and seldom cares to question on his own initiative. Such a work does good where a fair and honest

quantum of responsibility is felt in such an attitude as we believe is here manifest. The revisions and additions are evidence of this sense. But in accordance with the style above noted is the ever-present sense of remoteness both in the original and in the revision. The author does not enter largely into discussion or detail. His treatment is curt and summary, but measurably complete.

HEBER NELSON HOOPLE

INFECTIOUS DISEASES Their Etiology, Diagnosis, and Treatment By G H ROGER, Professor Extraordinary in the Faculty of Medicine of Paris, etc Translated by M S GABRIEL, M D, New York Octavo, 864 pages Philadelphia and New York Lea Brothers & Co, 1903

The time is ripe for the making of this book. Some one was needed to condense and systematize up to date our knowledge about Infectious Diseases. This the author has done in his own way. His qualifications were adequate. Being a master in the biological laboratory, and having exceptional opportunities as a hospital clinician, he combined in himself the indispensable prerequisites for this task. The task was prodigious,—so much literature to be read, so much to be done in the laboratory, so much to be seen at the bedside, and withal so much of the scientific habit of mind to properly marshal the vast amount of material into a homogeneous volume. The author has measurably succeeded. He has written well. He has made his book interesting and useful. With enthusiasm and eloquence he has made a scientific book pleasing. He has practically given us a treatise on medicine from a new view-point. He asserts things he is nothing, if not positive. These are needed and valuable qualities in a good book. Besides, in the main, he succeeds in his aim and gets everything into one volume. We qualify his success, because of certain defects which we shall point out. But, first, we commend especially the chapter on Suppuration, valuable alike to the surgeon and the physician. The author is discriminating in his

chapter on Septicæmia and Pyæmia. Some of the author's statements are delightful in their very simplicity. In the chapter on Fever he states fever is "essentially characterized by an exaggeration of the chemical processes occurring in the organism," and "the fever of infections is a reaction of the organism against microbic toxins." Though the author has clear vision and logical acumen, we fear he is not always on his guard. At least we cannot leap with him to the conclusion that "all nervous affections (save family and hereditary disease) are caused by some infection or intoxication," because, as he says, inoculations with more or less virulent germs "in animals have produced a series of nervous affections and notably myelitis." We find him claiming, in a case of Landry's paralysis, where death occurred in a paroxysm of dyspnoea after paralysis of the feet and where the histological examination of the lumbar enlargement of the cord revealed altered nerve elements in the anterior horns without microbic foci (though the blood furnished pure cultures of the pneumococcus), that therefore the ascending paralysis was "due to pneumococcic infection." As a rule, the logic is more steady and reliable.

The short chapter on Mechanism of Immunity and Predisposition is one of the best. "The agglutinating reaction is specific. It is exercised only upon the element against which the animal reacts." "The modification of the fluids explains all acquired immunity." Statements like these are charming; they are easily accepted because so firmly stated, saving the reader from need of rebellious thought. The author is fully cognizant of the complexity of the problems, deals with them intelligently, and presents the most plausible case the facts afford.

Congenital Infections and Heredity and the Therapeutics of Infectious Diseases are both well-written and interesting sections and share our commendations. But in much of the rest of the book, and to some extent in these chapters, the author writes *too much*. A working knowledge is desirable, exhaustive analysis is not practicable in narrow limits. Therefore it is an error to attempt it, causing the style at times to become prolix and verbose.

where for the most part it is delightfully terse and vigorous. The result is we have a big book on our hands, where one half the size would have answered better. In a word, the laboratory is too much in evidence *here*. In fact, it would be a great desideratum to have all the author's knowledge that is available in kernels of truth and wisdom gathered into small space so as to stand out boldly and impressively, for the book is rich in good meat if we could but easily get at it to eat.

We can lay no serious charge at the door of the translator, though he has strangely retained the French word "*recidive*" in the text. The publishers' part also has been well done. But we have a comment to make on this book in common with others emanating from European sources. In the first place, it contains a stingy index. Of all books that needed a liberal index, even a cross-index, this one most. In the second place, though we have credited the author with wide reading, generously acknowledged in his text, yet, like so many of his continental confrères, he almost completely ignores work and literature of England and America. Not once is there mention even of *yellow fever*, and, though many names are included in references to the work of Laveran, Patrick Manson and Ronald Ross are omitted. The title of this book is on the face of it a claim to comprehensiveness. All Americans will note with regret the failure to cite American researches in yellow fever and the name of our lamented Reed in its heroic relation to the study of that dire infection.

HEBER NELSON HOOPLE

SOCIAL DISEASES AND MARRIAGE. By PRINCE A. MORROW, A M., M D., Emeritus Professor of Genito-Urinary Diseases in the University and Bellevue Hospital Medical College of New York. Octavo, 390 pp. New York and Philadelphia: Lea Brothers & Co., 1904.

It is the object of this work to set forth the dangers introduced by venereal diseases into marriage, and to indicate the most

effective means to prevent these dangers or to limit and circumscribe their spread. In pursuance of his plan, Dr. Morrow has divided his book into three parts, the first of which deals with Gonorrhœa and Marriage, the second with Syphilis and Marriage, the third with matters pertaining to Social Prophylaxis. The large part which gonorrhœa in recent decades has come to be recognized as playing is suggested by the fact that the section of this book devoted to the consideration of this part of the subject is the largest of the three. There is nothing sensational nor hysterical in the author's methods. His points are clearly made, and his statements of fact are in full accord with present knowledge. It is a book worth reading upon a subject that ought to be plainly and fully treated. Any intelligent adult would be benefited by its perusal, and it is not likely that its circulation will be confined to physicians.

LEWIS S. PILCHER

TO CONTRIBUTORS AND SUBSCRIBERS

All Contributions for Publication, Books for Review, and Exchanges should be sent to the Editorial Office, 386 Grand Ave., Brooklyn, N. Y.

Remittance for Subscriptions and Advertising and all business communications should be addressed to the

ANNALS OF SURGERY,
227-231 South Sixth Street, Philadelphia

ANNALS OF SURGERY

VOL XXXIX

MAY, 1904

No 5

ORIGINAL MEMOIRS.

LYMPHATIC CONSTITUTION CARE OF THE LYMPHATICS DURING AND AFTER SURGICAL OPERATIONS¹

BY FREDERICK GWYER, M D ,
OF NEW YORK

THE dual title of this article is necessitated by the relation existing surgically between the two subjects

The subject of this paper was suggested to me about a year ago by the unfortunate result following an ordinary operation for the removal of a few lymphatic glands from the axilla of a child. An outline of the case is as follows

Several months before I saw the boy, aged about six or seven years, the glands in the axilla became inflamed, and finally suppurated, the abscess opened and discharged, and eventually healed to a very small sinus, which continued to discharge. The patient was referred to me by Dr Joseph E Winters. On examination, I could readily feel a number of glands against the chest wall, and there was present a small and short sinus. I thought it possible to close it by local treatment without operation, which the family wished to avoid, so I treated the patient by ordinary

¹ Read before the New York Surgical Society, January 13, 1904

means for several weeks, during which the sinus became still smaller, as also the glands. At a certain stage, however, there was no further progress, so I decided to operate. During my treatment the boy developed whooping-cough, but this had subsided at the time of operation, and the patient was practically well of it.

During the operation chloroform was used as the anæsthetic because of the greater ease of administration to so restless a child, and because of some remaining bronchitis. Personally, I have a strong preference for ether, even in children, and habitually use it as the safer anæsthetic of the two.

I removed the sinus and several glands more or less broken down and resembling the usual tubercular glands. I encountered unusually little bleeding, only two or three clamps being used, which were removed at the close of the operation without the necessity for tying any vessels.

The operation was completed about twelve o'clock noon, the boy being left in very good condition. I had a telephone message in the evening that the patient was slightly restless, but otherwise doing well. At three o'clock the next morning, I was called to the telephone by the nurse, who reported a temperature of 103° F, rapid pulse, great restlessness, and some delirium. When I reached the boy, within half an hour, I found the report to be true, and that the condition had been coming on gradually for several hours. The dressings and wound were all right. Dr. Winters arrived about five, and a conjoint examination brought us to the conclusion that the trouble was cerebral. Everything possible was done for the child, but the temperature gradually rose to 105° F, the delirium continued and increased, coma succeeding the delirium, until the end, which occurred about twelve o'clock, twenty-four hours after the operation.

The very unusual and rapid termination from such a comparatively common and simple operation was of course unlooked for, and has caused me much thought with a view to the cause.

The patient was of an extremely nervous temperament and rather unmanageable. He was of fair complexion, somewhat anæmic, and the surface lymphatic glands throughout the

body were palpable. A casual inspection of the mouth and pharynx showed a chronic enlargement of the tonsils and thickening of the pharyngeal membrane.

After canvassing the symptoms most carefully and hunting for the cause most diligently, the thought occurred to me that perhaps infectious material had been carried to the brain. No arteries of appreciable size were cut, the veins cut were most minute, were immediately clamped, and did not bleed when the clamps were removed, and it seems, if infection had taken place, it must have been through the lymphatics.

In some of its features the case presents a similarity to the reported cases of lymphatic constitution, and I would be quite willing to consider it such, provided another condition were added,—that of infection.

My case presented the superficial symptoms of fine silky hair, fair complexion, enlarged surface lymphatic glands, and enlarged tonsils and adenoids, also some anæmia, and the peculiarity of unusually little bleeding at the time of operation. All of these favor the diagnosis of lymphatic constitution.

The child bore the anæsthetic remarkably well, although it was somewhat hard to control in the preliminary stage.

Three symptoms after operation stand out prominently,—the high temperature, the delirium, and the rapid termination.

Of the reported cases, one by Dr. Blake (*ANNALS OF SURGERY*, 1902, xxxv, 745), in a paper read before this Society about a year ago, resembles mine most nearly. It was one of operation for phimosis on a boy of two and a half years. Chloroform anæsthesia, condition good immediately after operation. Slight restlessness during the night. Pulse weaker towards morning (132). Drowsiness, coma, and death twenty-three hours after operation. The highest temperature was 101.4° F. My case resembles this one, except that in mine the temperature was higher (105° F) and the delirium marked.

Some of the fatalities reported occurred during anæsthesia and before the operation was begun, others at a variable time after operation, and still others where no anæsthetic was given nor operation performed, as in several sudden deaths reported

by Nordman and Paltauf of persons who fell into the water, but whose deaths were not due to drowning

It would seem to me that Halstead ("Anæsthesia in Children," *Philadelphia Medical Journal*, 1900, Vol vi, 859) strikes very near one of the roots of the matter in saying, "Chloroform, fear, shock, are all strong cardiac depressants, any one of the three capable of producing death through cardiac syncope, and when all these are combined, as is often the case in anæsthetizing frightened children, the patient is necessarily in a critical condition at the very beginning of anæsthesia"

Taking the symptoms of lymphatic constitution so far as they are known, and considering those which can be readily diagnosed, plus others which may be suspected, it would appear to me that the condition is probably very common. That perhaps we are hunting too wide for the cause of death, and that in *constitutio lymphatica* we have simply a weakened condition, low vitality, and slight, if any, recuperative power

Struma is, I believe, considered to be the forerunner of tuberculosis, or even a tubercular condition in which the disease is very slowly progressive and inactive. The general symptoms resemble the lymphatic constitution so closely that one is struck by the similarity, if not identity, of the two. The question arises as to whether or not *constitutio lymphatica* may not be a tubercular condition of still more inactive form, a condition presenting everything favorable to the development of tuberculosis, and perhaps really of tubercular origin. I presented this idea to Dr. Ewing, Pathologist to Cornell University, in a recent conversation, and he expressed the opinion that it was possible that future investigations would prove lymphatic constitution to be a tubercular condition.

Assuming the above reasoning to be correct, it would seem that *constitutio lymphatica* must be a general condition, and an exceedingly common one. An examination of our dispensary patients will reveal many cases presenting all the symptoms of the condition obtainable before death.

If this be so, many cases of lymphatic condition must have been operated on and have recovered. The diagnosis has been

made by autopsy. At the autopsy stress is laid on the presence of an enlarged thymus gland, but I am assured by Dr. Ewing that the condition may exist without such enlargement.

Hence, in *constitutio lymphatica* we have a general condition of low vitality, of predisposition, of slight resistance, together with an extremely fertile soil for the propagation and development of pathogenic bacteria.

Given this condition, we must change our prognosis and assume a graver one in the presence of any work involving fright, shock, or possible infection. This last possible infection is, I think, a cause of death which must be considered prominent in some cases. I refer to the possibility of the introduction of foreign material through the lymphatics at the time of operation.

In the case I report, we had a nervous, lymphatic child, no doubt of lymphatic constitution. Chloroform, fear, and shock were present, and besides these there was, in my opinion, based on the subsequent temperature and delirium, an absorption of material from the wound through the opened lymphatic spaces and vessels. I need hardly say that the usual precautions were taken to prevent infection from the outside, so that if infection there were, it was of material already present in the operative field.

One of Dr. Ewing's cases ("*Lymphatic Constitution*," *New York Medical Journal*, 1897, Vol. lxvi, p. 37) might have been due to such a cause. It was a case of childbirth, shock, and hæmorrhage, head of the child torn off during version, all before admission to the hospital. On admission, the uterus was cleared, etc. Death in fifteen hours. The shock and hæmorrhage were not considered sufficient to cause death, which was attributed to lymphatic constitution. If we should add the probable absorption, through the wide open lymphatics, of the uterine contents, we would have another very likely cause.

We are familiar with the fact that infection is most commonly carried through the lymphatic system, but the only care we take to prevent such an event during operative work is to cut clean and not tear tissues. In malignant disease, for

instance, our best operators urge a clean dissection, and urge the use of the sharp end of the knife rather than the blunt end. This is no doubt good advice, as it is meant that the growth shall be entirely removed. But is it not possible that the very method which is seemingly best may be the means of a recurrence? Is it not possible that by cutting methods the spaces and vessels are opened more widely and through them infectious material finds its way into the general circulation? It is almost, if not quite, impossible to prevent some contact of infectious material with the clean surface of the wound during operation, and if reinfection does not occur more often, it may be due to other reasons rather than to protection at the time of operation.

If one considers the clinical course of an acute suppurative inflammation, we find in the presence of confined pus that the neighboring lymphatic trunks and glands are rapidly involved. Take the ordinary felon as an example. The more acute, the more rapid the involvement. Bacteria as well as many other animate things, even of a higher order of intelligence, follow the paths of least resistance. While the pus is confined, the pressure is greatest along the marginal lymphatic spaces, and the extension is in that direction, when the abscess is opened, the pressure is removed and the natural flow is to the outside, but there are no doubt some bacterial individuals who prefer not to mingle with the multitude, and there are others who are already started along the natural lymph channels, these are carried along by the current to start new foci elsewhere, or to be eliminated.

We take very good care that all bleeding vessels shall be occluded by ligature or otherwise, but the lymphatics, whether spaces, vessels, or glands, are left to take care of themselves. It seems to me it would be a step in the right direction to give some heed to possible infection through these sources, and to take such steps as possible to close such orifices not only at the time of operation, but subsequently.

I have acted on that plan for the last year, and, while I cannot prove it has made any difference in my results, I feel

assured that it has had an effect, and it is possible my cases would not have done so well had I not followed a certain plan, which I detail as follows

Care of Lymphatic Vessels—In operating on diseased glands, I have dissected them to the point of exit of the vessel, which I have then tied as I would an artery or vein. This has also had a value, as the arterial supply enters at about the same point as the emergence of the lymphatic, and there has been less hæmorrhage than otherwise. It has also facilitated the work in that the vessels, lying usually towards the bottom of the wound, dissection is more difficult, and if bleeding occurs, it is more difficult to control, but if dissection is carried to that point and a ligature is thrown about the pedicle, as it were, much time is saved.

As I have said, I cannot attribute any special value to the above procedure, judging from results, but I can state that all of my cases have done as well as the best heretofore, and the method has done no harm. On the other hand, I feel, had I not followed the above plan, I might very likely have had other results in some of the cases.

Care of the Lymphatic Spaces—These I care for in one of two ways, and will use as illustrations a case of empyema and one of abscess, such, for instance, as suppurative appendicitis.

When a good deal or all of the work can be done before the abscess is opened, as in a case of excision of a piece of rib for empyema, I do all that is possible in the cleanliest manner, then, before opening into the pleural cavity, I rub sterilized vaseline or a thick ointment, such as iodoform ointment made with vaseline or lanoline, thoroughly over all of the raw surface. I think this occludes the lymphatic spaces and smaller vessels until such time as there is no longer danger of absorption through them. The chest is then opened.

In case of ordinary abscesses, as soon as the pus is evacuated and the cavity washed out, I swab it dry, and throw in enough ointment or vaseline to fill it. This is not a new method, but its use has been more confined to treatment of suppurating bubo than to abscesses elsewhere.

Next, in the after-treatment of infected cases, such particularly as have cavities, it is my custom to fill them with ointment at each dressing or occasionally, as may be. The ointment should be something which at least will dissolve, hence, I would not recommend bismuth or oxide of zinc, on the other hand, there should not be enough poisonous material in the ointment, such as iodoform, to affect the patient.

I would again say I could reach no conclusion as to the value of the methods employed as all of the cases did well, hence, a detailed report of cases would be a waste of your time and have no value. But the impression I have received is that my cases have done better, have run less temperature, have had less local symptoms, and have had fewer complications where I have used the above methods than where I have not. Take, as an illustration of a slight but annoying complication, two recent cases of empyema, the one treated as outlined, the other simply opened in the ordinary manner, the first case shows no irritation in the wound or about it, the second at this writing is angry looking and the surrounding skin is excoriated to a marked degree.

I think the methods eliminate, in part at least, one of the causes of death in lymphatic constitution, and I have sufficient confidence in them to recommend them for consideration.

PULSATING EXOPHTHALMOS DUE TO TRAUMATIC ANEURISM OF THE INTERNAL CAROTID ARTERY

REPORT OF A CASE CAUSED BY A BULLET WOUND OF THE BASE OF THE SKULL

BY HAROLD L BARNARD, M S, F R C S, AND HUGH M RUGBY, M S, F R C S,

OF LONDON,

Assistant Surgeons to the London Hospital

W C was a ne'er do well, aged forty-two years, who shot himself in the mouth with a revolver, and was found bleeding from the mouth, nose, and left ear in a field thirty-six hours after the injury was inflicted. Dr Denning, of Epping, under whose care he came on October 16, 1901, sent him up to the London Hospital under my care.

When he was admitted on October 16, 1901, a ragged wound was found running upward and backward through the tuberosity of the superior maxillary bone to the base of the skull, which was perforated and smashed in the region of the left petrous bone. The wound was foul and the breath fœtid. The left side of the face was paralyzed completely. The left eye was protruded and the pupil dilated and fixed. Complete external ophthalmoplegia was present and the left cornea was insensitive, the eyelids were swollen and very prominent. When the eye was palpated, it was found to be pulsating vigorously, a thrill was present, and a bruit was heard with a stethoscope over the eyelids. On compressing the carotid in the neck the eye receded and the pulsation disappeared. The conjunctiva was œdematous, and soon this œdema increased so much that the mucous membrane herniated between the lids.

The left side of the face was completely paralyzed, but the movements of the palate were normal. The sensation of the face and neck was unimpaired and the movements of the tongue unaffected. Blood and cerebrospinal fluid escaped from the left ear, and the patient was quite deaf on that side.

Mr Rigby kindly saw the case with me, and we decided it would be best to ligature the left common carotid, and so attempt to save the left eye, and at the same time cure the arteriovenous communication which we supposed existed. To ligature the common carotid in a case of arteriovenous communication in the cavernous sinus which has existed for a long time is not a rational procedure, for one of two things may occur. Either the collateral circulation is good, in which case the exophthalmos will relapse almost immediately, or it is not good, when hemiplegia from anæmic softening will result.

In this case, however, the aperture of communication was recent, and, could we reduce the blood-pressure in the carotid for even a few hours, this aperture might well become closed permanently.

Operation Ligature of the Left Common Carotid, Slipping of the Ligature, Method of Rescuing the Artery—The left common carotid was accordingly ligated in two places and divided between the ligatures opposite the cricoid cartilage and through a small wound. When the ligature was tied, the respirations immediately became deep and slow, the proptosis diminished and the pulsation in the upper and lower lids disappeared. The left pupil slightly dilated, but remained immobile to light. Feeble pulsation could be felt in the superficial temporal artery on the left side, and the superficial temporal veins were very prominent.

I am now aware that several errors were committed in the technique of this ligature. The artery should have been ligated in continuity, and there was no need to divide it. Division of large arteries between ligatures was a method introduced, I believe, by Sir Thomas Smith. It was intended to permit the ends of the artery to retract up the sheath, away from a wound which would certainly become septic, thus diminishing the risk of secondary hæmorrhage. Now that primary wounds heal uniformly by first intention, it is unnecessary to continue this procedure.

The wound was too small, and the sheath was only opened three-quarters of an inch, and, as a consequence, the two ligatures converged below the artery, and were no doubt tied obliquely around it, and certainly not more than one-eighth of an inch of divided artery projected beyond the central ligature.

I must, however, claim to have tested the central ligature fairly well by pulling on it before I cut it short and let the artery retract

Whilst the wound was being closed, blood suddenly spouted up in great volume from the depth of the wound. I immediately plunged my right index down to the carotid sheath and plugged the hole in it with the tip of my finger. This practically stopped the hæmorrhage, but the anæsthetist had been told to discontinue the anæsthetic, the patient was coming round, and the rough pressure on the vagus caused spasm of the glottis and of respiration. A minute or so was spent in getting the patient deeply anæsthetized, and then I attempted to secure the artery by three distinct plans, only the last of which had any real chance of success.

First, I tried to grip the artery through the sheath below my finger with Spencer Wells forceps, but the sheath only slipped upon the artery, which indeed had retracted about an inch and a quarter.

Then I enlarged the wound with my left hand and tried to open the sheath below the end of the artery and secure the artery there, but I found the sheath infiltrated with blood at arterial pressure, and the first small aperture in the sheath I made spurted like an artery, and had to be secured with forceps. It was then that I saw that if the artery was to be secured at all, it must be low down where it left the thorax. I accordingly continued my incision to the sternum, separated and cut across the sternomastoid and omohyoid, operating all the time with my left hand. I then followed the pulsation of the carotid backward until it entered the thorax, and here compressed it against the body of the seventh cervical vertebra. On removing the right index, which had plugged the hole in the sheath all this time, no hæmorrhage occurred. Then taking a fine pair of scissors in the right hand I slit the sheath carefully down its inner side so as to avoid the internal jugular, which was distended from the pressure below. After slitting up the sheath for about three-quarters of an inch, the ligature was encountered, and about half an inch farther the round yellow end of the artery came into view. It was drawn out and secured by Spencer Wells forceps, and finally ligated with No. 4 silk. I have gone at some length into this accident because it is one which may occur to almost

any operating surgeon who divides large arteries between ligatures, and, secondly, because I have heard of two cases in which it happened to very eminent surgeons, and the artery was not secured, apparently because they restricted their efforts to the neighborhood of the wound in the sheath

Progress—The wound in the neck healed aseptically. The pulsation of the eye disappeared for four days, it then recurred, and finally disappeared about ten days after the ligature, but by this time the eye was blind and opaque

For two months the progress of the case was uneventful. The profuse flow of pus from the mouth and ear gradually diminished. Boric acid syringed into his ear came out of his mouth. The temperature oscillated, but there were no cerebral signs.

The bullet had been localized by skiagrams taken transversely and anteroposteriorly, and was known to be lying at a depth of one and a quarter inches just above the petrous bone, and probably in the temporosphenoidal lobe. I did not attempt to remove it during this period, because I thought an arterio-venous communication might still exist, and that I might find the thin veins of the cortex distended and pulsating at high pressure and too frail to hold a ligature.

Just two months after admission the patient began to complain of headache, and his temperature rose to 100° F, and on the following day he had a right-sided fit, chiefly limited to the face and arm and followed by decided weakening of the right-hand grip. The fit lasted seven minutes, and he was unconscious for four hours after it.

It was decided, in consequence of this fit, to remove the bullet and drain an abscess which was believed to exist around it.

Operation to remove the Bullet, December 24, 1901—The first thing we did was to exactly locate the bullet by means of X-rays and the fluorescent screen.

On his way to the theatre, the patient was wheeled into the dark room and the X-rays of a Rontgen tube were directed exactly transversely across his skull.

The bullet could be clearly seen on the screen. A pin was then thrust through the screen in the middle of the bullet shadow until it impinged against the scalp. The lights were turned up and this spot marked with aniline dye on the scalp.

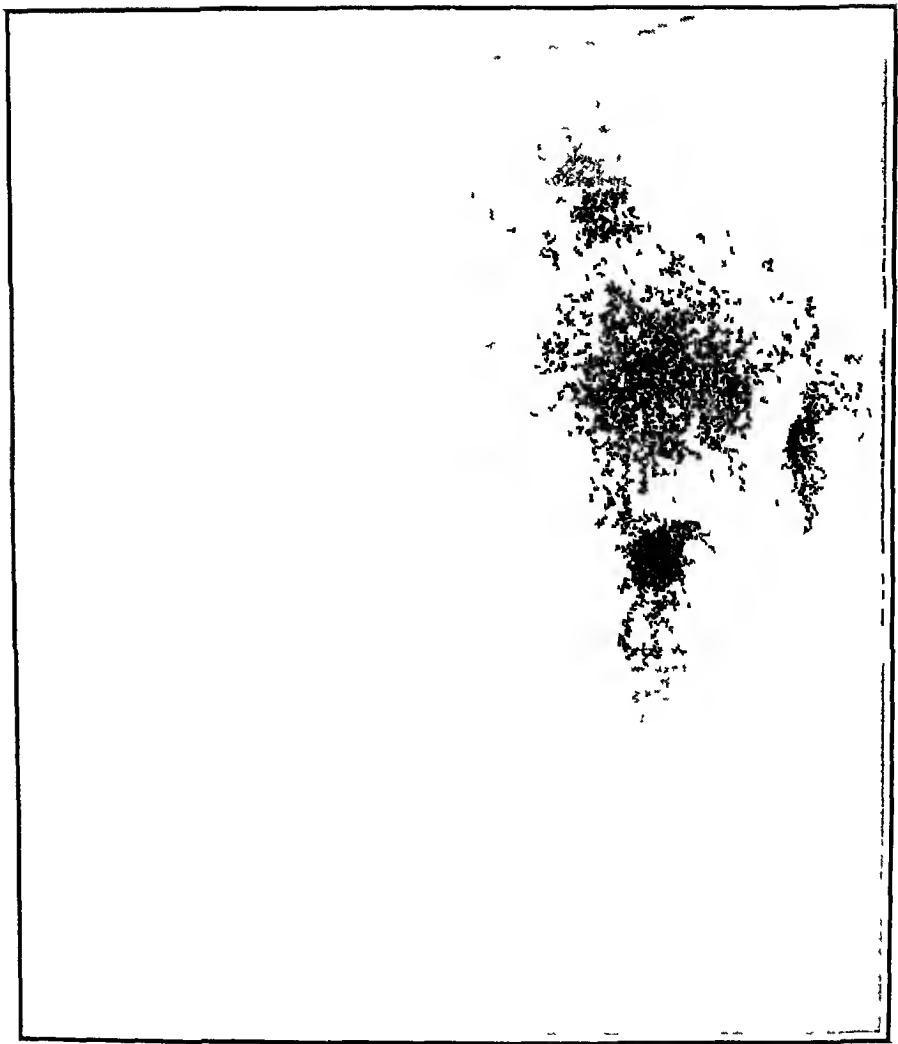


FIG 1—Skilogram of the skull of case of pulsating exophthalmos taken transversely, showing (1) Bullet one and one-half inches vertically above the external auditory meatus (2) The track of the bullet through the base of the skull

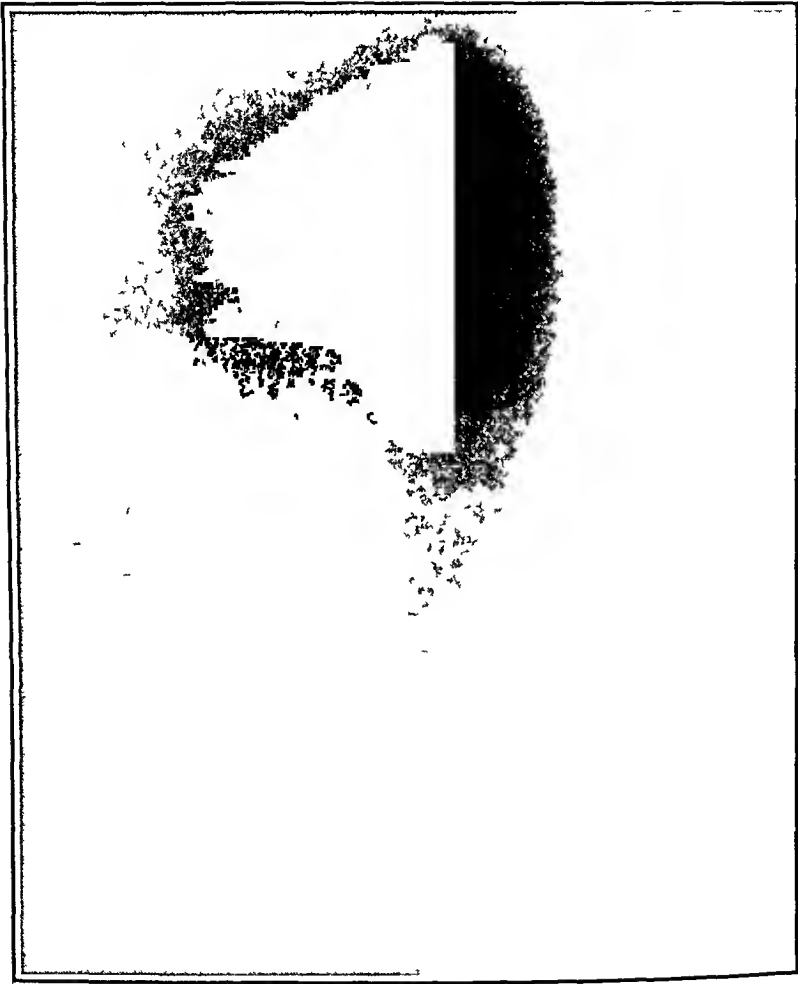


FIG 2—Skigram of the skull of case of pulsating exophthalmos taken anteroposteriorly, showing bullet misshapen at a depth of one and one half inches from the squamous bone, and one and one half inches above the external auditory meatus

This point was one and a half inches above and slightly behind the external auditory meatus

In the theatre, this point was marked on the skull by a steel pin driven through the scalp. A flap was then turned down and the pin of the trephine applied to this point. A disc of bone no larger than a shilling was removed. The dura was incised and a director passed transversely across the brain. At a depth of three-quarters of an inch gas and foul pus escaped, and the director struck a sharp object, which was seized with forceps and removed. It was found to be a separated portion of petrous bone. The wound was then enlarged with forceps and much pus evacuated, and the little finger inserted into the abscess cavity. At a depth of one and a half inches the bullet was felt lying on the top of the petrous bone and still entangled in the dura with several small fragments of bone. It was removed. The abscess was irrigated out and a drainage tube inserted. The patient improved for a day or two, and then a hernia cerebri developed, and his temperature and pulse became subnormal. The brain was explored cautiously, but the abscess cavity was apparently efficiently drained.

He died with signs of cerebral compression two months and a half after the accident.

Autopsy—A large abscess was found in the upper part of the temporosphenoidal lobe extending into the lower part of the Rolandic area. It was as large as a Tangerine orange. It did not communicate with the abscess around the bullet, which was efficiently drained. Apparently it had originated in the bruised area in front of the bullet, and was perhaps partly due to the anæmia produced by the ligature of the common carotid.

The left half of the skull as far back as the petrous bone was removed for careful dissection of the causes of the pulsating exophthalmos.

Mr Hugh Rigby very kindly undertook the dissection, and has contributed the description which follows.

The illustration is by Mr T. Wood Jones. The skiagrams and photograph of the bullet by Mr Hamack.

Report of Dissection, and Remarks by MR RUGBY—There is a small circular hole situated on the inferior surface of the zygomatic surface of the great wing of the sphenoid left side.

A probe inserted into this, passed upward, backward, and slightly outward, and finally appeared at the ragged opening seen on the upper aspect of the base of the skull at the tegmen tympani. It must have passed in front and just external to the first curve in the intracranial course of the internal carotid in the apex of the petrous portion of the temporal bone. It likewise must have crossed obliquely and antero-externally to the left Eustachian tube and beneath the left Gasserian ganglion.

The superior maxillæ and pterygoid processes of the sphenoid bone had at the post-mortem examination been sawn off flush with the base of the skull. The path of the bullet from the palatal surface of the superior maxilla was up and back through the posterior part of the tuberosity of the superior maxilla and the pterygoid process to reach the zygomatic surface of the great wing.

On examining the base of the skull from above, a ragged hole about the size of a half-penny was evident at the site of the left tegmen tympani. There was an inch trephine hole in the squamous part of the left temporal bone. The only other thing to notice on the surface was a hard, firm, rounded swelling at the posterior part of the left cavernous sinus, this was thought to be a thrombosed cavernous sinus. A dissection was now made to expose the internal carotid artery in the whole of its intracranial course, at the post-mortem examination the supra-occipital had been separated from the exoccipitals with bone forceps. The basioccipital was cut through in a line from the anterior extremity of the condyle of the occipital to the posterior wall of the carotid canal, at the posterior end of the cavernous sinus. In this incision the inferior and superior petrosal sinuses were necessarily divided, they did not show any change from the normal.

A second incision was next made from the posterior condylod foramen obliquely forward and outward to the jugular foramen.

The piece of bone (exoccipital) between the two cuts, foramen magnum posteriorly and petrous of temporal anteriorly, was then removed, the bulb of the lateral sinus was next opened up, this and the lateral sinus itself were quite normal. The portion of the petrous forming the inner wall of the carotid canal

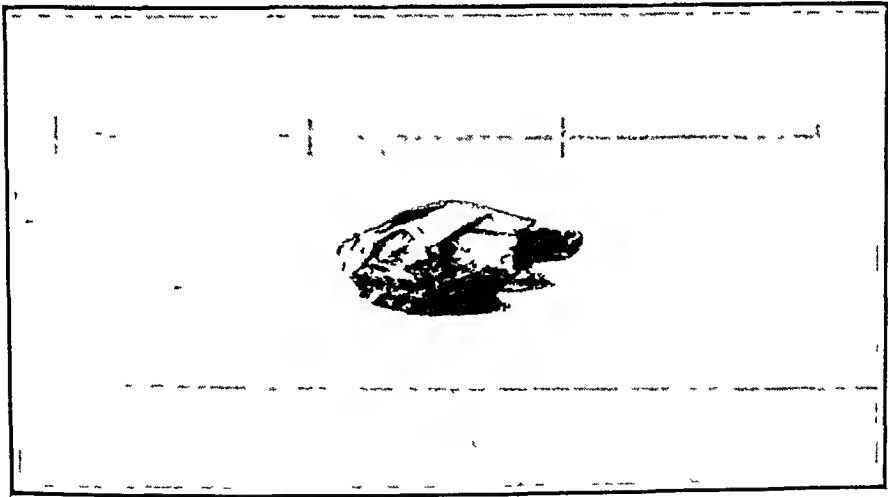
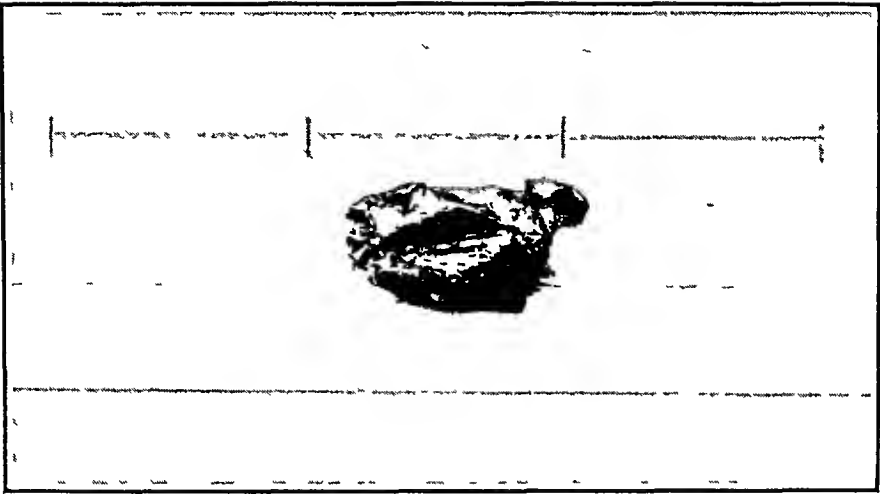


FIG 3—The bullet extracted from the brain of case of pulsating exophthalmos Actual size
The scale is in inches

was next chipped away with the forceps and the carotid freely exposed from behind, from the entrance on the inferior aspect of the petrous to its exit on the lateral wall of the basisphenoid.

The Cavum Meckelii was next opened up and the Gasserian ganglion removed, the three divisions having been divided close to their exit from the skull. The cavernous sinus was next

FIG 4

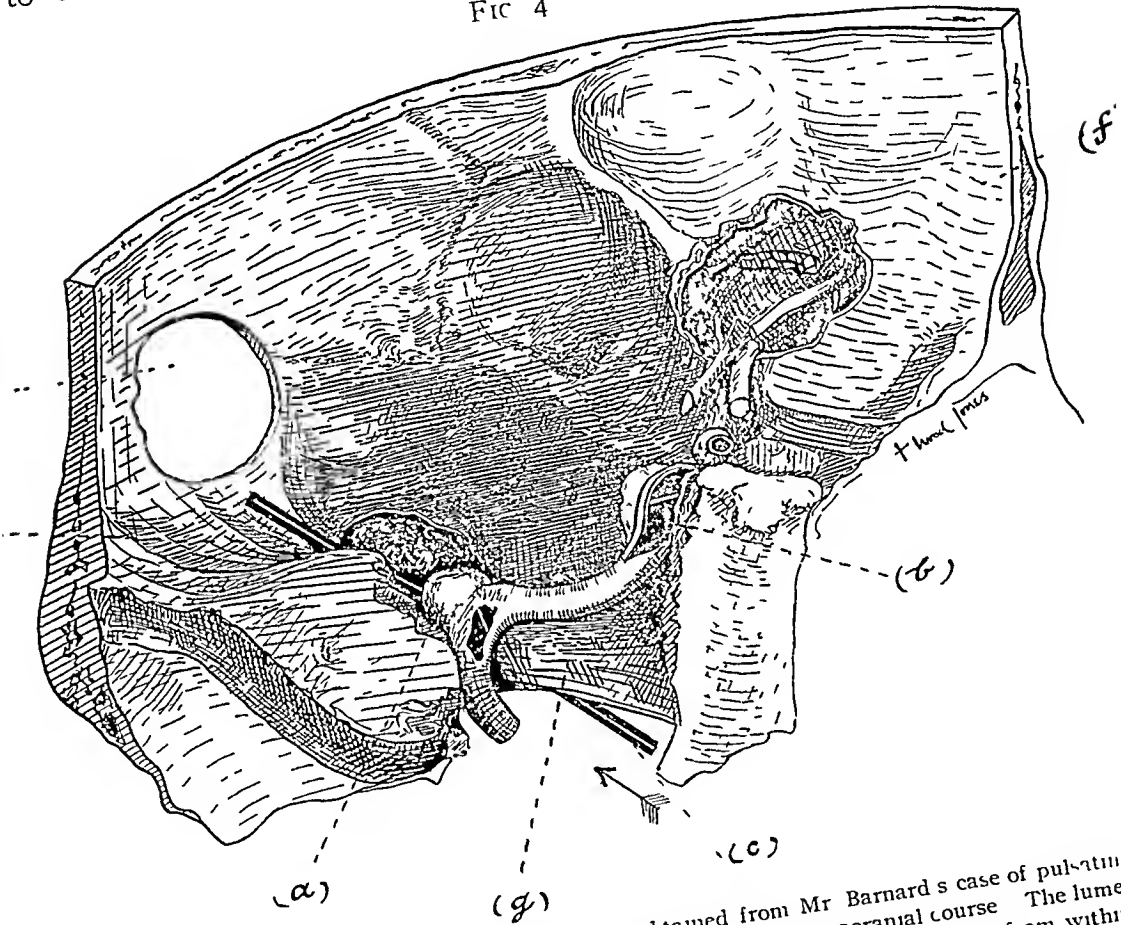


Diagram of a dissection of the specimen obtained from Mr Barnard's case of pulsating exophthalmos, showing the left internal carotid artery in its intracranial course. The lumen of the artery has been opened up to show the mouths of the aneurismal sacs from within. The contents of the left orbit have been dissected from above.

The following are the points of interest in the diagram: a, Sacculated aneurism at the first bend of the internal carotid in the petrous bone adjoining the exit of the bullet in the middle fossa; b, sacculated aneurism at the second bend of the artery at the posterior part of the left cavernous sinus; c, glass rod indicating the track of the bullet, which passed from below upward; d, ragged hole in the tegmen tympani caused by the exit of the bullet; e, trephine hole in the squamous bone through which the bullet was extracted; f, the contents of the orbital cavity dissected from above; g, the Eustachian tube.

displayed by dissecting off the dura mater and the nerves on its outer wall

The carotid exposed by this dissection was seen as follows. At the antero-external side of the artery at its first bend in the canal in the petrous bone was situated a small, well-defined sacculated aneurism filled with firm clot. Another aneurismal swelling, localized, oval, and filled with firm clot was situated on the outer side of the artery in the posterior half of the left cavernous sinus, the third, fourth, ophthalmic division of fifth, and sixth nerves were stretched on its outer wall.

The cavernous and the other sinuses in this region were small and empty of blood. No communication between the internal carotid artery and the cavernous sinus could be made out. The sphenoidal fissure was next opened up and the orbital plate of the frontal bone and lesser wing of the sphenoid cut through so as to expose the orbital contents from above, the fourth nerve, levator palpebræ, and superior rectus were divided and turned forward, the superior ophthalmic vein was then exposed, it was not enlarged, and contained practically no clot. The ophthalmic artery was small and quite empty. The optic nerve was intact, as were also the rest of the orbital nerves. The sheath of the optic nerve was more adherent than usual.

The chief points to note in this dissection are

(1) The presence of a double sacculated aneurismal dilatation in the intracranial course of the internal carotid artery

(2) That no arterial communication with a sinus was present

(3) That, although the aneurismal sac in the petrous bone could be accounted for by the fracture of the tegmen, no such explanation can account for the aneurism found at the posterior part of the cavernous sinus. No radiating fracture across the base could be detected.

(4) The absence of any noticeable dilatation of the sinus or ophthalmic vein.

The interest of this case I think depends chiefly on the fact that all the typical signs of a traumatic pulsating exophthalmos were found to be due to a sacculated aneurism of the carotid, and not to an arteriovenous communication. That an aneurismal dilatation of the internal carotid in its intracranial course

can give rise to this condition has been much disputed. A reference to the best known articles on this subject leaves one greatly in doubt whether such a condition is possible.

Mr. Rivington's paper is perhaps the earliest series of such cases recorded, this appeared in the *Medico-Chirurgical Transactions* in 1875, Vol. lvi, p. 183.

He there gives an excellent *résumé* of the previous literature dating back to 1809, when the first recorded case of ligation of the common carotid for this lesion is published.

Rivington's paper consists of seventy-three cases, which include all those recorded up to that date, viz., 1873. He bases the paper on a most interesting case in which digital compression, perchloride of iron injections, and, finally, ligation of the common carotid was performed, with a completely satisfactory result. Among these cases he quotes the results of twelve post-mortem examinations.

In no case was there found a simple traumatic aneurism on the internal carotid.

In ten the lesion was situated behind the orbital cavity.

In three traumatic cases there was a direct communication between the artery and vein.

In one case there was found an aneurism of each ophthalmic artery.

In three "idiopathic cases" there was found a rupture of an aneurism of the internal carotid in the cavernous sinus.

In one case a simple dilatation of the artery.

In eight cases the ophthalmic veins were found enlarged and varicose.

He concluded from the post-mortem examinations that

(1) The most usual lesion found is a direct communication between the artery and vein.

(2) That no case was found due to a traumatic aneurism of the internal carotid.

He further points out how an aneurism of the internal carotid in the cavernous sinus may exist without any signs of intra-orbital aneurism. In support of this, he quotes a case of Mr. Holmes and a case of Mr. Jonathan Hutchinson's.

In the latter case, a woman aged forty years, had a circumscribed sacculated aneurism springing from the outer side of the left internal carotid in the cavernous sinus. The sinus appeared to be obliterated. There were no orbital signs except those due to pressure on the third, fourth, and fifth nerves.

In the *Lancet*, 1896, Vol 1, 1559, Mr Rivington further makes the dogmatic statement, in reply to a paper published by Mr Walker, *Lancet*, London, 1894, Vol 1, pages 191-193,—

(1) That true pulsating exophthalmos cannot be caused by a circumscribed or fusiform aneurism of the internal carotid

(2) That the symptoms only appear if the artery ruptures and the blood enters the veins

These opinions are also stated in Heath's "Surgical Dictionary" in 1886, though here he admits that a case quoted by Dr Dempsey, of Belfast, in which an aneurism of the ophthalmic artery existed, modifies his conclusions somewhat.

The next important paper on this subject is by Professor Sattler, of Erlangen (Von Graefe and Soemisch's *Handbuch der Augenheilkunde*). He collected 106 cases, including those of Mr Rivington, and made a summary of the literature up to date, viz, 1887.

In four out of nineteen post-mortems, an arteriovenous aneurism was definitely found with tear of the artery in the cavernous sinus, his conclusions practically agree with those of Mr Rivington.

An illustration of a dissection of an arteriovenous aneurism in the cavernous sinus appears in this article, the chief noticeable feature of which is the enormous dilatation of the ophthalmic veins.

Professor Leon le Fort, in the *Revue de Chirurgie*, 1890, p 457, summarizes the results found in 100 cases.

In the traumatic cases he thinks that fracture of the base need not always exist as a cause of aneurism of the internal carotid. He is of opinion that the internal carotid in this region has a peculiar friability, which causes its coats to give way even after slight violence applied to the skull. This explanation might account for the aneurism found in our case.

at the posterior part of the cavernous sinus. He considers that aneurism of the ophthalmic artery, aneurism of the carotid in the cavernous sinus, or rupture of the carotid into the sinus, give rise to almost identical symptoms.

As a means for diagnosis between the two latter conditions, he lays stress on two points

(1) The existence of a "bruit de souffle" continuous with exacerbations is in favor of rupture of the artery, and that aneurism only gives rise to an intermittent bruit, Nélaton's sign.

(2) The pulsations in the former case are much more powerful than those in the latter, the direct flow of arterial blood into the veins causing a more marked result than a transmission simply of the systole and diastole of an aneurismal carotid.

He considers the commonest lesion to be rupture of the carotid artery in the cavernous sinus, and that the consequent abnormal development of the ophthalmic vein is the principal lesion and causes the chief symptoms. The results of eighteen post-mortem examinations of these cases are published in Norris and Oliver's "Hand-book of Diseases of the Eye," and as a result the following statements are made

(1) In no single case of true aneurism of the internal carotid in the cavernous sinus were there found any signs of venous stasis exophthalmos nor pulsation during life.

(2) That most cases of pulsating exophthalmos consequent on extra-orbital lesions are due to rupture of the internal carotid into the cavernous sinus.

In the Middlemore lecture at Birmingham in 1898, Henry Eales attributes pulsating exophthalmos to an arteriovenous communication.

Ligature of Common Carotids—The question of the advisability of ligature of the common carotid in these cases has well been a controversial one, as Mr. Barnard has pointed out. The treatment by ligature of a recent traumatic case differs widely from that of a long existing or idiopathic one.

In favor of the treatment by ligature, one can simply refer

to the numerous cases quoted in the literature in which this operation was performed with perfect results

It is striking, also, to find how those who have contributed most largely to this subject are practically unanimous in its favor, *e g*, Mr Rivington urges ligature of the common carotid in traumatic cases

His figures are as follows In 26 cases, 23 recovered, 14 were cured, 3 died

In 44 cases, *ie*, idiopathic plus traumatic, the results were 26 cases cured, 7 partial, 5 failures In 17 vision was restored, in 3 the bruit persisted Both carotids were tried in three cases

He considers the operation is contraindicated in the very aged

The return of symptoms after ligature he ascribes to

(1) Return of the flow on the same side due to deficient coagulation of the blood

(2) The veins may close on the same side, but the blood reaches the other eye by the ciliary sinus

(3) A fresh aneurism may appear in the opposite eye

Professor Sattler says that ligature of the common carotid is *the* treatment for traumatic pulsating exophthalmos dependent on either of the three conditions previously mentioned

Professor Le Fort is also strongly in favor of early ligature

His statistics are as follows Ligature of common carotids, 61 per cent successful cases, 54 per cent cured

In compression of the common carotid 86 per cent of cases were not improved He goes farther, and says that if the exophthalmos is double, if the ligature on one side has failed, and if then pressure on the other side checks the pulsations and bruit, that one should not hesitate to tie the other carotid

Henry Eales (*vide supra*) is of opinion that ligature of the common carotid is only indicated in the young, and in those whose life is seriously threatened That in other cases ligature may be deferred because

(1) Cases have existed for years without hæmorrhage or any fatal symptom

(2) There have been a few cases of spontaneous cure

(3) Both carotids have been consecutively tied without success

Mr Walker, of Liverpool, in a paper in the *Lancet*, published 1894, p 193, strongly urges early ligature of the carotid in these cases. The paper is based on the notes of two cases in which ligature was performed, the striking feature in one of these being the return of vision in the affected eye

Mr Walker is of opinion that in early cases, except in direct stabs and wounds from fragments of bone, the lesion is at the outset a traumatic aneurism of the internal carotid, and that in time this gives way and the blood enters the cavernous sinus

Coggin, in *Archives Ophthalmic Society*, New York, 1883, p 187, performed a post-mortem examination on a patient in whom ligature of common carotid was performed with subsequent hemiplegia and death

He found the ophthalmic veins to be rather larger than usual, and a well-marked aneurismal dilatation of the cavernous portion of the internal carotid artery. The ligature was applied five weeks after receipt of injury, typical signs of pulsating exophthalmos were present

The arguments quoted against the operative treatment for this condition are based upon

(1) The records of several cases in which physical signs and symptoms had existed for a prolonged period, with but little marked effect on the well-being of the patient or little danger to life

The following very striking cases may be quoted as an example of this

(a) Mr Williamson, in *British Medical Journal*, 1894, Vol 11, p 806, showed a case in which the symptoms, bruit, venous dilatation, pulsation, etc., had lasted for twenty-three years. The lesion in this case was due to an injury to the head, with signs of fracture of the base of the skull

(b) A case exhibited at the Ophthalmological Society by Mr Adams Frost in 1882

A man who twenty-eight years before had been run over by a wagon. Ptosis, pulsation, bruit, were present on both sides. No operative treatment had been attempted.

(c) In the *Ophthalmological Transactions*, Vol. ix, is a case reported by Adolph Brunner.

Sixty-five years' duration, dating from an accident when twelve months old. There was marked ptosis and pulsation, well-marked bruit, no subjective noises, nor cerebral disturbances.

(2) The recurrence of symptoms and signs after ligation.

This is found to have taken place in many cases. The pathological condition in these had lasted for some time, months or years, and no doubt the failure was in every case due to the collateral circulation having been well established.

A case published by Knapp, *Archives of Ophthalmological Society*, New York, p. 201, is a good example of this.

Mr B, New York, seven years before sustained an injury to the head which led to symptoms of arteriovenous aneurism. The common carotid was ligatured, but feeble pulsation was felt forty-eight hours later. The protrusion of the eye, which had at first subsided, returned markedly, and the eye had to be enucleated two years later.

Professor Sattler quotes similar cases in his table, viz., Morton's, Fotheringham's, and Hansen's.

Mr Reeve, in the *Transactions of American Ophthalmic Society*, 1904, mentions a case of single pulsating traumatic exophthalmos in which both carotids were ligatured with an imperfect result.

The risks incurred by ligation of the common carotid.

These are (a) Sepsis. (b) Hæmorrhage, either immediate from slipping of the ligature or recurrent from ulceration of the vessel wall. (c) Cerebral complications and hemiplegia.

Sir John Erichsen, quoted in Jacobson's "Operations of Surgery," says that in 25 per cent cerebral symptoms occur,

either early or remote. In the aged and in those subject to atheromatous disease the percentage will probably be much higher than this.

Coggin, in *Archives Ophthalmic Society*, New York, 1883, p. 187, quotes a case of a patient, aged sixty-six years, in whom hemiplegia and death followed ligation of left common carotid five weeks after injury. In this case, P. M., optic vein rather larger than usual, there was a marked aneurismal dilatation of the cavernous portion of the internal carotid artery.

The two cases mentioned in Rivington's paper who succumbed were aged sixty-three and sixty-five respectively.

(d) The occurrence of blindness in the corresponding eye after ligation is reported by Sigrist in *Archives Ophthalmic Society*, New York, 1898, p. 542.

(1) In a case of ligation of the carotid for cancer of the tongue, embolism of the central artery of the retina on the same side followed with consequent blindness.

(2) In a case of traumatic pulsating exophthalmos the external and internal carotids were tied simultaneously, central artery embolism followed.

(e) Homonymous hæmianopsia followed ligation in one case quoted by Axenfeld.

The following statistics of the results of ligation of the common carotid are published in Tillmann's "Text-Book of Surgery," Vol. II, Chap. 10.

In 320 cases, 170 recovered and 132 proved fatal, a mortality of about 41 per cent.

Of these 132 cases, 78 were caused by cerebral affections.

In 23 cases, ligation of both common carotids were followed by five deaths,

W. Zimmerman (quoted by Tillmann) in 65 cases quotes a mortality of 31 per cent, 26 per cent of these showed brain symptoms.

Pilz and Friedlander (also quoted by Tillmann) give the mortality as 18 per cent and 13 per cent respectively.

Conclusion — (1) That a traumatic sacculated aneurism

of the internal carotid in the cavernous sinus can give rise to the typical symptoms of pulsating exophthalmos

(2) That this lesion can follow a head injury without being directly caused by basal fracture

(3) That there is no evidence to prove that this condition does not always occur at first, and a communication with the veins is a later and secondary consequence

(4) That the signs of pulsating exophthalmos are not necessarily due to the presence of arterial blood in the ophthalmic veins, and need not be dependent on excessive dilatation of these veins

(5) That in young subjects and in traumatic cases seen early, ligation of the common carotid is the best treatment

RHINOPHYMA.¹

REPORT OF A CASE, WITH OPERATION FOR ITS RELIEF

BY WILLIAM W KEEN, M D ,

OF PHILADELPHIA,

Professor of Surgery in the Jefferson Medical College

F W , aged sixty-five years, a tailor, was admitted to the Jefferson Medical College Hospital October 26, 1903 His family history is of no importance, excepting that no case of tuberculosis or of malignant disease is known to him He himself never suffered from the diseases of childhood, but thirty years ago he had an attack of smallpox He denies venereal disease He was discharged from the German army in 1862 owing to the fact that he had convulsions at times These came on eighteen months after he had enlisted, and were irregular in their occurrence He has had none for over a year There is no history of injury to his nose

Fifteen years ago he had what appears from his description to have corresponded to an attack of acne rosacea, when his face became reddened with a marked eruption of small pustules His entire face soon became involved, but the brunt of the attack was on his nose and over a considerable adjacent area of each cheek The face improved, but the nose got worse, and began slowly and gradually to enlarge It has not interfered with his breathing, but has seriously interfered with his eating He cannot take any liquid, for example, soup, in a tablespoon without lifting his nose upward out of the way The nose is painless It is apt to bleed a little in the morning, owing to his rubbing it in washing his face

On admission, a very large growth appears to involve all the nose except the upper quarter The growth is very lobulated with deep fissures between the lobules, the larger mass being on the right side It is firm to the touch and, if one may

¹ Read before the Philadelphia Academy of Surgery January 4, 1904

judge from the color, would seem to be highly vascular. The alæ of the nose are particularly thickened (Figs 1 and 2).
Urine normal.

Operation, October 28, 1903, under ether. I excised the central portion of the growth from the upper margin of the diseased area down to the tip of the nose by an elliptical incision, the long axis of which corresponded to the bridge of the nose. I then sutured the edges. The pressure of my finger in suturing the lobules of tissue squeezed out from the ducts of the sebaceous glands a number of columns of sebaceous matter, commonly known as "worms". On the alæ of the nose, as it was impossible to obtain a suitable ellipse, I contented myself by simply shaving off all the hypertrophied tissue. The hæmorrhage was not severe, not a single vessel had to be ligated. A few clamps applied for a few minutes and the sutures checked the hæmorrhage almost entirely, and a little adrenalin solution applied on the raw surface where I had shaved it completed the hæmostasis. Between the dressing and skin a bit of gutta-percha tissue was placed so as to prevent adhesion of the dressing to the wound, which would retard the cicatrization.

He made a perfectly smooth recovery from the operation.

On November 4, one week after the operation, a little further paring of the alæ of the nose, so as still further to improve its appearance, was done. On December 12 another operation was done, inasmuch as the second operation left a slight fissure between the ala and the tip of the nose on the left side. The edges of this were pared and approximated by a few sutures. December 17, five days later, these silk sutures were removed. The photographs showing the result of the operation were taken on December 21 (Figs 3 and 4).

The operation on November 4 was done without any anæsthetic, as it was very slight and he suffered relatively little pain. At the third operation, I infiltrated the nose with a little β -eucaine and adrenalin, but the infiltration was not successful in allaying the pain. At the end of this little operation he had a brief, but marked, general convulsion, during which he seemed to lose consciousness.

Professor Coplin, to whom the specimen was sent, reports that the "histologic examination shows the majority of the sections to be composed mainly of fibrous tissue, a part of the border



FIG 1 —Appearance before operation,



FIG 2 —Appearance before operation



FIG 1.—Appearance after operation



FIG 3.—Appearance after operation. The corrugated condition of the skin is more marked than on the nose itself

being formed of stratified epithelial cells, such as are found in normal skin, though the layers of cells are rather fewer in number than is usually found. The corium and subcutaneous tissues are directly continuous with, and similar in structure to, the deeper parts of the sections, which are composed of fairly loose, cellular, fibrous tissue containing numerous lymph spaces and blood-vessels. The fibrils of this tissue are exceedingly wavy and irregularly placed. A very conspicuous feature of the sections is the sebaceous glands, which are greatly increased in size and in some areas apparently in number, presenting in the latter instances an adenomatous appearance. Around some of the infoldings of the skin are quite dense accumulations of small mononuclear cells.

“*Diagnosis*—Soft fibroma of the skin with distention of the acini, and possibly a hyperplasia of sebaceous glands.”

Remarks—This is one of the most marked cases of acne rosacea terminating in a true rhinophyma that I have ever seen personally. In the *Beitrag zur klinische Chirurgie*, Band xxxix, Heft 1, von Bruns gives some excellent illustrations, some of them colored in a very lifelike manner, of this condition. The photographs of the present case show, without, however, the advantage of color, the condition before operation, and how successfully the patient was relieved from not only his deformity, but of a serious disability so far as his mingling in social life was concerned, especially at meals, for no one likes to eat at table with another person when the latter has to lift his nose out of the soup with each spoonful.

In some of these cases surgeons have been deterred by the fear of hæmorrhage, which the experience of von Bruns and the present case show is not well founded. The result of the operation was all that could be desired, as the photographs show.

My experience in this case would lead me to suggest that it is desirable, in case the entire skin is not removed and the edges sutured, but the skin shaved off that this shaving should not go entirely through the skin. In only one place towards the tip of the nose on the left side did I shave away the entire thick-

ness of the skin At this point there is distinct scar tissue In other parts of the nose, where I only shaved one-half or two-thirds through the thickness of the skin, there is a cutaneous surface which, though not entirely normal, is much better than the scar tissue

SIALOLITHIASIS ¹

BY O THEODORE ROBERG, M D ,

OF CHICAGO, ILLINOIS,

Surgeon to the Swedish Covenant Hospital

SIALOLITHIASIS is of relatively infrequent occurrence In 1896, Futterer ¹ was able to collect 160 cases I have collected forty-seven cases occurring since that time

The following case was seen by the writer in November, 1902

Mr M , aged fifty-eight years, came to me complaining of a large, diffuse, and painful swelling, involving the right side of the neck and lower part of face

In 1874, for the first time, the patient noticed that a lump appeared in the right submaxillary region when he ate something sour or saw something which caused his mouth to water The swelling usually attained the size of a walnut, and would remain for from thirty minutes to two hours, disappearing gradually This occurred from once a week to once or twice a year until 1893, when the swelling appeared and remained for six weeks Before this there had been very little pain At this time the floor of the mouth became swollen, reaching to the cutting edge of the lower teeth, and the patient began to have much pain, which was referred to the right side of the lower jaw Two teeth were extracted, but without relief There was a good deal of pain and difficulty connected with swallowing, but none with chewing or speaking He noticed a small amount of pus discharging from under the right side of the tongue, and was told by some physicians that he had a cancer Dr Fenger, who was then consulted, removed a pea-sized stone from Wharton's duct, and five days later sutured the opening made into the duct It is probable that the stone had existed for nineteen years

After this the patient remained well until August, 1901

¹ Read before the Chicago Medical Society, January 27 1904

(eight years), when a hard and painful swelling, the size of a hickory-nut, again appeared in the right submaxillary region. During the next six months it increased gradually in size, after which the entire side of the neck began to swell and became painful. In February, 1902, he consulted a doctor, who incised the swelling, giving exit to a large amount of pus. After two weeks the incision had closed. After this, however, the swelling did not disappear entirely, and during the next eight months there were periods during which the swelling became larger and painful, subsiding again in a few days. In October, 1902, the swelling became quite large and very painful. For several weeks following this there was an occasional discharge into the mouth of a sweetish taste. There was a sense of fulness in the mouth, some pain on swallowing, and difficulty in opening the mouth.

Previous History—He has never been sick in bed. Formerly, he smoked and chewed tobacco excessively, keeping the tobacco in the right side of the mouth. His saliva used to flow very freely when he used tobacco. His teeth were in good condition until 1885, when he began to suffer with Rigg's disease. Since that time there has been excessive tartar formation on the teeth. There is no history of infection of the salivary glands, of the mouth, or of tonsillitis.

Family history negative.

On examination, November 25, 1902, the right side of the neck and face was swollen, the swelling reaching as high as the malar bone, and as low down as the clavicle, and it was most prominent in the submaxillary region. The skin over this area was dark red in color and oedematous. On palpation it was somewhat painful. In consistency it was of board-like hardness. There were no areas of softening, nor could any fluctuation be detected. Inspection of the mouth showed no swelling or discoloration of the mucous membrane. There was recession of the gums with considerable tartar formation on the teeth. Digital examination of the floor of the mouth revealed a hard nodule, the size of a large pea, on the right side, opposite the position of the second molar tooth. It was immovable, and felt as if it were attached to the inner surface of the lower maxilla. A needle introduced into the nodule gave exit to a small amount of pus and apparently did not strike any hard body, and the nodule did not diminish in size after the escape of pus. A No

2 Bowman probe was passed into Wharton's duct as far as the nodule. There was no sensation of contact with a hard body. The left side of the neck was normal and no glands could be felt on either side. Temperature 99° to 100° F. Urine examination, negative.

A diagnosis was made of calculus in Wharton's duct, and probably in the submaxillary gland, with suppuration of the gland and suppurative cellulitis of the neck.

November 26, 1902. I made an incision, under local anaesthesia, into the mass, and a small amount of thick, curdy pus escaped. One week later the swelling was considerably smaller, and pus had ceased to discharge. The patient was then anaesthetized. The nodule in the mouth was incised, and by means of a small curette a concretion the size of a split pea was removed. An incision about three inches long was then made externally, parallel with the lower border of the jaw, and one-half inch below it. By means of blunt dissection through a mass of dense scar tissue the submaxillary gland was exposed and removed. The wound was packed with iodoform gauze, and only partly closed. A second calculus was found lodged in the beginning of the duct.

Five weeks after the operation the wound was completely closed. After the operation there was paresis of the angle of the mouth, from which the patient had completely recovered four months later.

In order to determine whether there was anything in the patient's saliva that would throw light on the etiology of concretions, I collected his saliva and determined the total solids, inorganic solids, and reaction, with the following results:

Total solids, 86 per cent

Inorganic solids, 28 per cent

Alkalinity to litmus, first specimen, 5 cubic centimetres saliva required 4 cubic centimetres, $n/100$ oxalic acid

Second specimen, 5 cubic centimetres saliva required 7.5 cubic centimetres, $n/100$ oxalic acid

Acidity to phenolphthalein, first specimen, 5 cubic centimetres saliva required 2.9 cubic centimetres, $n/100$ potassium hydroxide

Second specimen, 5 cubic centimetres saliva required 1.3 cubic centimetres, $n/100$ potassium hydroxide

In determinations of normal saliva by Chittenden and Richards, the total solids varied from 32 per cent to 102 per cent, and the inorganic from 15 to 28 per cent

The reactions as given above also correspond with most analyses. Therefore, in regard to solids and reaction, the saliva is normal

Description of the Concretions—The larger concretion is spherical in shape, and measures 6 to 7 millimetres in diameter. It weighs 2 grammes. The smaller is somewhat pyramidal in shape and measures 3 to 4 millimetres in diameter. They are light grayish brown in color. The surface has a cauliflower appearance, except where the stones had been in contact with each other, where there is a facet on each stone. Section of the larger stone shows it to be made up of three parts,—the central a nucleus, a round, hard body which lies in a cavity somewhat larger than the nucleus, next to this cavity are several lamellæ which can easily be separated from one another, the outer layer is more compact and darker in color. The smaller stone on section is seen to be made up of two parts,—the central soft and spongy, the outer harder and more compact. (See illustrations.)

The gland measures 3.7 centimetres by 2.5 centimetres by 2 centimetres and weighs 8.5 grammes. The mesial surface is quite smooth and free from adhesions, and the external surface is covered with fibrous tissue. It is of cartilaginous hardness, and the cut surface is smooth and glistening. There are numerous pinhead-sized points, which are of a more grayish color, and lack the glistening appearance of the greater part of the gland. Pressure upon the gland causes a thick yellowish-white fluid to exude from these points. Smears of this fluid show polymorphonuclear leucocytes, degenerated epithelial cells, and an occasional diplococcus. Means were not at hand to make cultures.

Histologic Examination (By Dr P. Bassoe).—"About two-thirds of the sectional area are found to be occupied by a dense old fibrous tissue. Between its bundles, and particularly around the vessels, both large and small, are collections of round cells, most of which possess the morphologic characteristics of plasma cells. Some vessels, however, are not surrounded by such cells. The endothelium of the smaller vessels has participated in the inflammatory proliferation. There are no acini remaining in the section, but many glandular ducts are present and in-

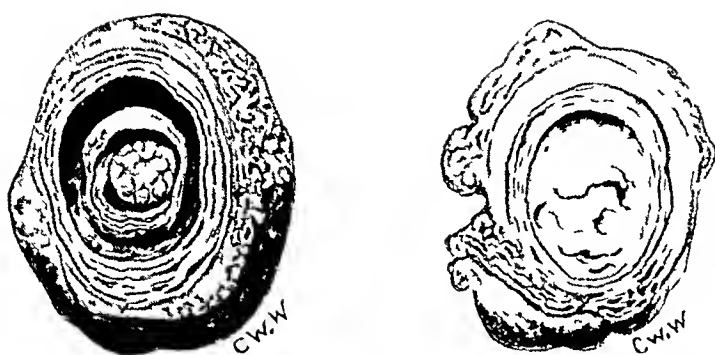


FIG 1 —Interior of larger calculus, magnified six diameters

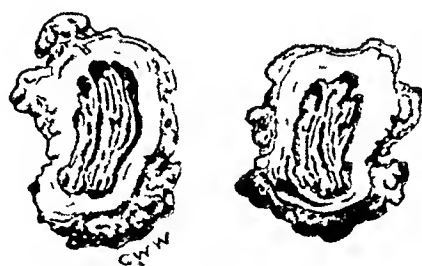


FIG 2 —Interior of smaller calculus magnified six diameters

variably surrounded by large collections of round cells. Their epithelial lining is proliferating, and the lumina contain degenerated epithelial cells and a few polymorphonuclear leucocytes. The latter cell is also seen here and there outside the ducts. In sections stained for bacteria by the Gram-Weigert method, short bacilli are found in small number. They are short, rather thick, generally occur in pairs, and are deeply stained.

"I also examined a slide from another portion of the gland. This contains a larger amount of gland tissue, otherwise it answers to the description given above."

Calculi occur most often between the ages of twenty years and forty years. Burdel³ reports the occurrence of a calculus in the sublingual duct of a child aged three weeks. There had been difficulty in nursing, and it is reasonable to conclude that it had existed at the time of birth. Men are more often affected than women. Czygan⁴ gives the proportion of two to one. Another writer gives five to one. (Duparque and Melian⁴)

Calculi vary in size from that of a grain of sand to one measuring one and one-eighth inch in length and two inches in circumference⁵. The usual size is from that of a split pea to that of a date-stone or hazel-nut. They occur most often singly. In the forty-seven cases collected by the writer there was more than one calculus in seven cases. A large number of small concretions may be discharged from the duct, as in Spencer's⁶ case, in which also the submaxillary gland was filled with milium calculi. Recurrence takes place in a small percentage of cases. Of these forty-seven cases, there were five with recurrence, one had⁷ three recurrences in twenty-two years, one, two recurrences, and two, one recurrence.

In shape, the calculi are usually spherical or oval, in the ducts they often become elongated and resemble date-stones. When multiple in the duct they are arranged end to end, and the opposed surfaces are faceted. The surface is finely or coarsely granular and the color is a dirty yellowish gray. Usually the structure and composition are homogeneous. To this there are numerous exceptions as in the writer's case and others.

Potties⁸ reports a case in which the calculus was made up of two parts,—the central consisting of uric acid and a small amount of calcium phosphate and calcium carbonate, the outer part being made up of calcium phosphate and calcium carbonate, about 69 per cent of the former and 20.1 per cent of the latter. Galippe has also described concretions which had a laminated structure. In a few cases foreign bodies have been found as nuclei. Calculi are made up mostly of calcium phosphate and calcium carbonate. Some contain ammonio-magnesium phosphate. The following analyses are taken from von Gorup Besanez.⁹

	1	11
Calcium carbonate	81.3	2
Calcium phosphate	4.1	75
Soluble salts	6.2	
Organic matter	7.1	23
Water, etc	1.3	

The following table shows the relative frequency of the occurrence of calculi in the various glands and ducts.

	In Wharton's Duct	In Submaxillary Gland	In Stenson's Duct
Czygan	22	4	4
Writer's	28	14	2

	In Parotid Gland	In Sublingual Duct D Rivine D Barth	In Sublingual Gland
Czygan	1	5	1
Writer's	1	0	0

Etiology—The cause of calculus formation in the salivary glands or ducts has been the subject of much discussion. In some of the early reported cases foreign bodies were found within the calculi. Naturally, it was concluded that these were the cause of their formation. The foreign bodies found were pieces of fish-bone, wood, bristle, and a shot. Foreign bodies have been found in only a small percentage of cases. In one case a cavity was found corresponding to a mustard seed, which it was thought had found its way into the duct. This is important, as it indicates that a foreign body can be the cause of a calculus and become disintegrated and disappear. In this con-

nection, it is important to note the occurrence of foreign bodies in the ducts without giving rise to the formation of calculi. Cabot¹⁰ reports a case in which a piece of straw had been lodged in Wharton's duct for six months. In another case¹¹ there was a piece of hair in Stenson's duct for two months. Cosens¹² reports two cases in which particles of glass had been lodged in the submaxillary duct and sublingual duct,—in the former for eighteen months, and in the latter for four months. In all these cases suppuration took place without the production of calculi. Foreign bodies are found in the ducts more frequently without the production of calculi.

Galippe¹³ has made cultures from the interior of the calculi, and has found bacteria in all cases. He concludes, therefore, that bacteria constitute the essential etiological factor. Hartman¹⁴ has likewise found bacteria in smears and cultures. It appears reasonable that bacteria should be a *sine qua non*. But if infection alone were the principal factor, why do not calculi occur more frequently, and why do they not occur most frequently in the gland and duct which are most often the seat of infection, namely, the parotid and its duct?

If bacteria give rise to the formation of the calculi, how do they do so? It is ordinarily stated that saliva undergoes acid fermentation. This is probably true in the presence of carbohydrates, which may be found in the mouth, but we do not expect this to take place in the ducts or glands. I have made a number of experiments, with a view of determining whether the tendency of the saliva is towards acid or alkaline fermentation. With the proper precautions, I have collected saliva into a sterile bottle and determined the degree of alkalinity to litmus and degree of acidity to phenolphthalein. Saliva is usually alkaline to litmus and acid to phenolphthalein, which shows, of course, that the reaction is due to the presence of the hydrogen phosphates and carbonates. In some cases the saliva was allowed to stand at room temperature, and in others it was placed in an incubator for from one to several days. Invariably the degree of alkalinity was increased and the acidity decreased.

Results of determinations in two specimens

Specimen 1 Fresh Five cubic centimetres saliva required 4 cubic centimetres n/100 oxalic acid, and 29 cubic centimetres n/100 potassium hydroxide

Same specimen, twenty-four hours later, room temperature, 5 cubic centimetres required 5 cubic centimetres n/100 oxalic acid, and 11 cubic centimetres n/100 potassium hydroxide

Same specimen, seven days old Five cubic centimetres required 62 cubic centimetres n/100 oxalic acid (Quantity of saliva insufficient to determine acidity)

Same specimen, nine days old Five cubic centimetres required 125 cubic centimetres n/100 oxalic acid (Quantity of saliva insufficient to determine acidity)

Specimen 2 Fresh Five cubic centimetres required 75 cubic centimetres n/100 oxalic acid 13 n/100 potassium hydroxide

Same specimen, twenty-four hours in incubator Five cubic centimetres required 9 cubic centimetres n/100 oxalic acid (Quantity of saliva insufficient to determine acidity)

This is important, because the calcium phosphate and calcium carbonate, of which the calculi are made up, are rendered insoluble by the increase in the degree of alkalinity. It requires very little change in the composition of saliva to cause a precipitation of the calcium salts. If saliva is exposed to the air for a short time, CO₂ escapes, and a thin film forms on the surface, which on examination is found to be calcium carbonate. Hence the removal of CO₂ alone is sufficient to precipitate the calcium salts. When the bacteria decompose the proteids in the saliva, ammonia is produced, which probably immediately unites with the CO₂ held in solution, and we promptly have the conditions favorable for calculus formation. From this it is reasonable to conclude that the bacteria cause a precipitation of the calcium salts of the saliva by increasing the alkalinity of the saliva and removing the CO₂, as explained above. But this does not explain why calculi are found so much more frequently in the submaxillary gland and its duct than in the others.

Obstruction to the outflow of saliva, retention and consequent thickening of the saliva, have been given to explain the formation of salivary calculi. Salivary cysts are less frequent than salivary calculi, in fact, they are quite rare. In the cases of salivary cysts which I have found reported, in only one was there a deposition of the insoluble salts, and that was

in a parotid duct cyst ¹⁵ Salivary cysts of Wharton's duct are the least frequent, while, as we have seen, calculi occur there most often

Loveland ¹⁶ reports a case of occlusion of Stenson's ducts in a middle-aged woman, which probably dated back to an attack of diphtheria at the age of thirteen years Here was a case of retention of saliva for years without any concretions forming

Skirving ¹⁷ reports a case of shorter duration, with thickened and viscid saliva, without any concretions It is improbable that salivary cysts are an important etiological factor

We naturally ask, Why do calculi occur so much more frequently in the submaxillary gland and its duct? We must explain this fact by either the anatomical conditions of the duct or the composition of the submaxillary saliva, as differing from that of the other glands As factors predisposing to a precipitation of the calcium salts, we will mention a high percentage of solids, high percentage of organic matter, greater degree of alkalinity, and a low content of CO₂ The sublingual saliva contains more total solids, more organic matter, more mucin, and has a higher degree of alkalinity than the saliva of the parotid and submaxillary glands The amount of CO₂ is about the same in all the salivas Therefore, if the composition of the saliva should determine where the concretions would most likely occur, they would occur in the sublingual gland and its duct As a matter of fact, the occurrence of a stone in the sublingual gland and its duct is rare We must therefore look to the anatomical conditions for an explanation of the greater frequency of occurrence of calculi in the submaxillary gland and its duct If we exclude stasis of the saliva as an important cause of calculus formation, the length of duct and direction of duct, whether upward or downward, are of little significance

In what way could the anatomical conditions favor the production of calculi? It is admitted that bacteria are an essential etiological factor We have stated that the parotid gland is the one most often the seat of infection Inflammation of the ducts

also occurs in the absence of infection of the glands. According to Kuttner,¹⁸ inflammation of Stenson's duct is most frequent. If we admit the bacterial origin, alone, of the calculi, the anatomy of Wharton's duct does not explain why the greater proportion of calculi are found there. Foreign bodies are found in Wharton's duct more often than in the others. Of seven cases of foreign bodies in the ducts which I have found reported, four were found in Wharton's duct, two in Stenson's duct, and one in the sublingual duct.

From the foregoing, it appears that something in addition to bacteria is necessary to explain the production of calculi. To me that something appears to be a foreign body. Foreign bodies, particles of tartar and food can enter Wharton's duct more readily than the others, because of the greater size and the location of the orifice. The composition of tartar is very similar to that of the calculi. Therefore, although tartar might often be a determining factor, we would be unable to demonstrate it. Food particles might easily undergo decomposition and simply add to the percentage of organic matter in the calculus. The question arises whether a constitutional condition can in any way predispose to calculus formation. If a general cause were at all active, we would expect it to exert an influence upon more than one gland in a given case, and give rise to calculi in the several glands or ducts. In only one case¹⁹ have calculi been found in more than one gland or duct in the same person. It appears probable that an increase in the total solids of the saliva may be a predisposing factor. Langley and Fletcher²⁰ have shown that the salts of saliva increase directly with the rate of secretion.

Ballard²¹ reports a case in which calculi were discharged five years after the patient was salivated during an attack of jaundice. In the writer's case there is a history of excessive flow of saliva caused by the use of tobacco.

The symptoms of salivary calculus are determined by the size of the calculus, its location, and the occurrence of suppuration. In the absence of suppuration, a calculus may exist for years without much disturbance. There are cases on record in

which calculi have existed for fourteen, twenty-eight, and even forty years^{22 23 24 25} The most characteristic symptom of calculus in Wharton's duct, and usually the earliest, is the so-called "salivary colic" of the French, characterized by intermittent retention of saliva, and accompanied by more or less pain and discomfort This retention of saliva, with the formation of a swelling in the floor of the mouth and in the submaxillary region, usually comes on when eating, and remains for one or several hours, disappearing gradually Or it may be made to disappear by pressing upon it, expressing the retained saliva into the mouth This swelling may come and go for years, as in the writer's case, until suppuration occurs, when the swelling becomes more or less permanent The retention is not determined entirely by the size of the calculus Weber²⁶ reports a case in which a concretion the size of a mustard seed caused retention, while there are some cases with a calculus the size of a cherry-stone or date-stone, in which there have been no symptoms of retention

The patient may be aware of the presence of a hard nodule in the mouth There is usually some difficulty in chewing, swallowing, and speaking, at times, chewing and swallowing may be almost impossible It may be difficult to open the mouth The swelling in the floor of the mouth may reach the cutting edge of the teeth Freudenthal²⁷ reports a case in which the abscess became so large that death resulted from asphyxiation The abscess frequently bursts into the mouth, often discharging the calculus also If only one calculus has been present, a cure results Sometimes the stone causes a pressure necrosis of the overlying tissues, escaping through the opening thus made In rare cases⁷ the calculus may be discharged through the normal orifice of the duct Winslow²⁸ reports a case in which he found a calculus in a swelling directly over the larynx Several months before, the patient had noticed a swelling underneath the tongue, which had disappeared spontaneously With suppuration in the duct, there is usually infection also of the gland giving rise to a painful swelling of the submaxillary gland

When the calculus occurs in the submaxillary gland, the gland enlarges and becomes firm in consistency and tender to palpation. The gland may remain slightly enlarged and tender to the touch for years, it increases slowly in size, and usually becomes more painful. There are periods when the gland swells acutely and becomes very painful, to subside again to its former condition. Eventually a suppurative cellulitis of the neck may supervene, and a diffuse phlegmon involving the greater part of the side of the neck and face develops, resembling a case of Ludwig's angina. Even this may subside, as happened in the writer's case, to return at a later date. If not opened, it may burst spontaneously. In some cases a fistula results, discharging pus and concretions.²⁹

In twenty-seven cases of fistula of Stenson's duct discharging saliva, as given by Duplay and Reclus,³⁰ three were caused by calculi. I have not found a salivary fistula of the other ducts or glands caused by calculi.

The constitutional effects of salivary calculi are usually slight.

Diagnosis — A diagnosis of salivary calculus is easily made when there is a history of "salivary colic," followed by an inflammatory swelling in the floor of the mouth. The calculus can often be detected by sounding the duct. Retention of saliva and suppuration can be caused by foreign bodies in the ducts, or by an inflammation of the duct in the absence of any foreign body. An abscess in the floor of the mouth, in the absence of a history of retention of saliva, may suggest an alveolar abscess. The abscess which develops about the submaxillary gland is very easily mistaken for an alveolar abscess if a good history is not obtained. When the calculus occurs in the gland, it may be difficult to arrive at the correct diagnosis. A gradual enlargement, with periods of acute inflammatory symptoms, suggests a calculus. Syphilis, tuberculosis, actinomycosis, malignant disease, and the "inflammatory swelling" of Kuttner³¹ must be considered. A large percentage of the cases are diagnosed malignant disease.

In a case reported by Gerota,³² a calculus in the submaxillary gland was detected by the X-ray

Treatment —The indications are to evacuate the abscess, remove the calculus, and in some cases to extirpate the gland. When a stone is located in the duct, it should be removed through the mouth. This can usually be done with local anaesthesia. However, at times bleeding is very free, and the stone is so difficult of removal that a general anaesthetic becomes necessary. In some cases the granular surface of the calculus is very firmly adherent to the surrounding tissues, making its removal somewhat difficult. The removal of stones in Stenson's duct through the mouth may be impossible. Solé³³ removed six calculi from Stenson's duct from the outside, suturing the duct, and obtained healing by primary intention, without any salivary fistula. Fenger was in the habit of suturing the opening made into Wharton's duct, although made from inside the mouth. If a gland has been the seat of infection secondary to a calculus in the duct, even for a long time, the enlarged gland becomes normal in size in from one to two weeks after the removal of the calculus.¹⁹

If the submaxillary or sublingual gland is thought to be the seat of a calculus, it must be reached from the outside. After exposure of the gland, it is incised. If a single calculus is found and the gland not much changed, the calculus can be removed and the gland left. If the calculi are multiple and difficult to remove, or the gland is the seat of multiple abscesses, it is well to extirpate the gland.

In case of calculus of the parotid gland, incision, removal of the calculus and drainage are, of course, all that could be done.

BIBLIOGRAPHY

¹ Fütterer. *Medicine*, Detroit, 1896, p. 550.

² Chittenden and Richards. *American Journal of Physiology*, 1898, Vol. 1, p. 461.

³ Burdel. *Compt rend de l'Acad des Sc*, Paris, 1860, Vol. 1, p. 893.

⁴ Cited by Kraus in Nothnagel. *Spec Path und Therap*, Band 111, 1, p. 83.

⁵ Thorowgood. *Transactions of the Pathological Society*, London, 1872, Vol. 111, p. 103.

- ⁶ Spencer Transactions of the Pathological Society, London, 1898, p 85
 - ⁷ Launay Bull et Mem de la Soc d'Anat, Paris, 1900, p 76
 - ⁸ Potties Bull de l'Acad Roy de Med d Belge, 1897, p 838
 - ⁹ v Gorup Besanez Lehrb d physiol Chemie, 1874
 - ¹⁰ Cabot Boston Medical and Surgical Journal, 1887, Vol cxvii, p 606
 - ¹¹ Overall Medical Record, New York, 1888, Vol xxxiii, p 519
 - ¹ Cosens St Bartholomew Hospital Reports, London, 1897-98, Vol xxxviii, p 105
 - ¹³ Galippe Compt rend d la Soc de Biol, 1886, pp 116 and 377
 - ¹⁴ Hartman Bull et Mem de la Soc d Chir, Paris, 1898, p 165
 - ¹⁵ Latour-Marliac Arch Gen de Med, 1825, p 52
 - ¹⁶ Loveland Medical Record, New York, 1890, Vol xxxviii, p 605
 - ¹⁷ Skirving Australasian Medical Gazette, 1887, p 279
 - ¹⁸ Kuttner, in Handbuch der praktischen Chirurgie, 1902, Vol 1, p 649
 - ¹⁹ Hanszel Wien klin Wochenschr, 1900, p 160
 - ²⁰ Langley and Fletcher Philosophical Transactions, London, 1889-90, p 152
 - ²¹ Ballard Transactions of the Pathological Society, London, Vol lviii, 1867, p 93
 - ²² Bruce Transactions of the Pathological Society, London, Vol lvii, 1866, p 134
 - ²³ Maguire British Medical Journal, 1901, Vol 1, p 825
 - ²⁴ Masterman British Medical Journal, 1901, Vol 1, p 148
 - ²⁵ D'Aicy Power Transactions of the Pathological Society, London, 1888, p 103
 - ⁶ Weber Transactions of the Pathological Society, London, 1897, p 121
 - ²⁷ Freudenthal Journal of the American Medical Association, 1898, Vol xxx, p 469
 - ²⁸ Winslow Journal of Eye, Ear, and Throat, Baltimore, 1896, Vol 1, No 3, p 13
 - ²⁹ Juffinger Wien klin Wochenschr, 1896, p 306
 - ³⁰ Duplay et Reclus Traite de Chir, Vol v, p 393
 - ³¹ Kuttner Verh d Deutsch Gesellsch f Chir, 1898, p 581
 - ³² Gerota Dental Cosmos, January, 1903 (Abstract)
 - ³³ Sole Presse Med, Belge, Brux, 1897, p 113
- Other references
- Cloudot Arch de Gen Med, 1874
- Hulke Transactions of the Pathological Society, London, 1873, p 88
- Hulke Lancet, London, 1894, Vol 1, p 9
- Claisse et Dupre Arch de Med Exp, Vol vi, 1894
- Dixon Lancet, London, 1887, Vol 11, p 1063
- Hanszel Wien klin Wochenschr, 1903, p 4
- Constant Journal of the British Dental Association, London, 1897, p 701
- Berger Bull et Mem de la Soc de Chir, Paris, 1889, p 599
- Nove Josserand Province Med, Lyon, 1896, p 500
- Killian Munch med Wochenschr, 1897, p 975
- Sick Munch med Wochenschr, 1897, p 1486
- Wolf Texas Medical Journal, Austin, 1897, Vol xiii, p 396

STRICTURE OF THE ŒSOPHAGUS DUE TO TYPHOID ULCERATION.

BY JAMES E THOMPSON, M B, B S, ^{L.R.C.S.} F R C S (ENG),

OF GALVESTON, TEXAS,

Professor of Surgery in the University of Texas

THE literature of stricture of the œsophagus following an attack of typhoid fever is meagre enough to justify recording three that have fallen under my notice since the year 1896

CASE I—O G, aged seventeen years, male, white The patient came under my observation in the spring of 1896 suffering from a tight stricture of the œsophagus In the fourth week of typhoid fever he complained of difficulty in swallowing As stated by his family physician, the fever was of a severe type, but not prolonged beyond the sixth week, and free from all serious complications There was nothing in the manner of treatment that deserves comment

The difficulty in swallowing became more evident as convalescence progressed, and in a few weeks he was unable to swallow anything but liquids

Nine months after the subsidence of the fever he came under my care, at which time the stricture was so tight that he took about half an hour to swallow a glass of water He was not greatly emaciated, owing perhaps to the fact that he had accustomed himself to swallowing milk the whole day long

I attempted to pass a bougie (the smallest in my œsophageal set), but was unable to pass a stricture near the cardiac orifice of the stomach After much trouble, I succeeded in passing a long probe with an olive-shaped end about four millimetres in diameter

I then had a set of olives made, which could be screwed on to a flexible metal rod The diameters of the olives increased in size by one millimetre up to ten millimetres, above this the sizes increased by two millimetres In about four weeks I succeeded in passing one fourteen millimetres in diameter The patient

then returned home with a set of bougies of the ordinary kind, and with instructions to have them passed regularly

Soon after his return (before any bougies had been passed), he complained of feeling sick, and of soreness at the site of stricture. He then suffered from fever, and began to swallow with difficulty. Then he began to cough and vomit quite a quantity of mucus.

Swallowing became more and more difficult and nausea distressing, and the patient became weaker, and gradually sank three months after his return. No bougie was passed after he left my care.

CASE II—F P, aged twenty-six years, male, white. The patient suffered from a severe attack of typhoid fever, and at the end of the fourth week noticed a difficulty in swallowing capsules. At the end of the sixth week he noticed a difficulty in swallowing solid food. Soon he was unable to swallow any solids, and in a short time fluids began to pass with difficulty, causing hic-cough and regurgitation. Swallowing became progressively worse, until in October, 1902, ten months after the first onset of the fever, he found himself unable to swallow a drop of water.

He then came under my care, and for three days had been unable to swallow a drop of water.

On examination, I found a very tight stricture near the cardiac orifice of the stomach, fifteen and one-quarter inches from the upper incisors. This I succeeded in passing by using a bougie four millimetres in diameter. Treatment by gradual dilatation was instituted, and by December 20 I managed to pass one twelve millimetres in diameter. Dilatation was very slow, because treatment had to be stopped for days on account of soreness at the point of stricture. A break in treatment occurred between December 20 and February 15. The stricture contracted to its former lumen, and treatment had to be started from the beginning. This time the dilatation was more rapid, and by the end of March I had succeeded in passing a bougie fifteen millimetres in diameter. The patient then left for home, provided with a set of bougies. I last heard from him in October, when he stated that he was getting along very nicely.

CASE III—J W B, aged twenty-six years, male, white. The patient had suffered from a very severe attack of typhoid fever which lasted seventy-two days. At the end of the first

month he noticed a difficulty in swallowing a capsule, which he said lodged in his gullet near the lower end

Liquids passed with ease After 100 days he was allowed to eat solid food, but found himself unable to swallow it It would pass as far as the lower end of the gullet, and occasionally stay there for several hours before it was regurgitated The difficulty in swallowing became more marked, until in February, 1903 (four and a half months since the onset of the fever), he came to consult me

At this time he could swallow liquids only On the whole he swallowed fairly well, taking about three minutes to swallow a glass of water On passing a bougie, it was arrested at a point eight inches from the upper incisors A smaller bougie was passed through this obstruction, and was arrested at a point thirteen and one-half inches from the upper incisors Thence it passed smoothly into the stomach

Treatment was continued on the same lines as in the other cases The strictures were easily dilated, and in thirty days we had succeeded in passing a bougie sixteen millimetres in diameter The patient then went home, but in three weeks returned with symptoms of closure The strictures were easily dilated, and he again returned home with a complete set of bougies

The histories of these cases is all the evidence that I have to present to prove that these patients suffered from typhoid fever This with the statements of the family physicians must be accepted as final

As to the frequency of ulceration of the œsophagus during the course of typhoid fever, opinions differ greatly

Louis¹ mentions œsophageal lesions as of comparatively frequent occurrence Out of forty-six autopsies, he found lesions present in the œsophagus in seven cases

Holcher² found only one instance of an œsophageal lesion, viz, gangrene in 2000 autopsies

Berg³ in 1628 autopsies found no lesions, and Dopfer⁴ none in 927 cases Louis's description of the ulcers, which has now become classical, is as follows "When few in number, the ulcers are confined to the region near the cardia or in the middle

part of the tube, or at least to within an inch or two from the bottom of the pharynx. Even under these circumstances, the ulcers were more numerous and larger near the cardia than elsewhere. They were oval in shape and directed vertically, the long diameter varying from two to twelve lines. Most of them were superficial, but some of them were deep, exposing the muscular coat. They had never gone on to perforation. They were not found in patients who died after at least sixteen days of the disease, and not at all in those who died between the eighth and fifteenth days (from Mitchell) ⁵

This frequency compares curiously with the most recent reports. Thus, Ouskow ⁶ in 439 autopsies, representing 6513 cases, found no definite œsophageal involvement in a single case. In the majority of the cases the pharynx was reddened, and in parts deprived of its epithelium and covered with membrane. In some cases the tonsils were so inflamed as to suggest diphtheria. Laryngeal ulceration was quite common, being present in 30 per cent of the autopsies.

Mitchell ⁵ reports one case of œsophageal ulceration occurring in Professor Osler's service at The Johns Hopkins Hospital. The histological description of this ulcer, which is most carefully described, was of a typhoid type, but no evidence could be found of the typhoid bacillus. The following is an abstract of the clinical features. The patient died on the eighteenth day of the disease. At the autopsy, the œsophagus showed three definite ulcers situated at its upper part. All three were nearer the posterior than the anterior surface. The two larger ones lay one on each side in the depression between the lateral walls of the œsophagus and the thyroid cartilage. The larger of these was on the left side, three centimetres from the commencement of the gullet. It was placed obliquely, and measured one centimetre in length by two and one-half centimetres in width. Its edges were sharply cut, and at its base the muscle was exposed. The base was clean. The other ulcer was almost opposite, circular in form, three millimetres in diameter, with a hæmorrhagic base reaching into the submucosa.

Riesmann ⁷ reports another autopsy. He found on the

upper part of the Œsophagus, on the anterior wall to the right of the middle line, a chain of four ulcers extending perpendicularly downward from a point three and one-half centimetres from the base of the pharynx (Unfortunately, no examination of the ulcers is reported)

As to the exact nature of these ulcers met with during the course of typhoid fever, nothing definite can be said

Louis did not consider them as due to typhoid infection, but rather as a complication due to the extreme malnutrition of the tissues It is very probable that the ulcers found at the lower end of the Œsophagus are due to peptic digestion of the Œsophageal mucosa In many exhausting diseases, where the patient has lain for a long time before death in an extremely weak state, ulcerative lesions of the Œsophagus have been observed Thus, Eversman⁸ reports numerous peptic ulcers above the cardiac orifice of the stomach, and also perforation of the Œsophagus But this theory will not satisfy us in the case of ulcer in the upper portion of the gullet Here it is quite probable that some of them are of typhoid origin The case described by Mitchell certainly belongs to this class histologically

The symptoms recorded in the cases met with clinically have been few *Dysphagia* has been the commonest In most of the cases this has been the only symptom In the three cases reported by me it occurred about the end of the fourth week, and was brought to notice by the inability of the patient to swallow capsules As a rule, in the cases reported, the stricture was revealed when the patients were allowed to take solid food *Hæmatemesis* has been noticed in one case only (Packard's) It is a fairly common event in many cases of typhoid fever, but in some of the cases in which this symptom was present the autopsies showed no Œsophageal lesions, therefore we have no right to assume, even in Packard's case, that the hæmorrhage was from the Œsophagus

There is no reason to think, in any of the reported cases, that the drugs given during the course of the fever had any part in the causation of the cicatrix

I have made a careful review of the literature, and find

that nine cases of stricture have been described, to which I personally add three more, making twelve in all. It is remarkable that, with one exception (Mitchell's case), all occurred in males.

The following is a brief *résumé* of the cases.

Packard's Case—Male, aged thirty-five years, white. A very severe attack of fever, during the latter part of which he suffered from hæmorrhages from the mouth and bowels. Two strictures were present, one twenty-five centimetres, the other thirty-one centimetres, from the incisors. Both were very tight. At last a bougie 25 millimetres in diameter was passed, after which the stricture was gradually dilated. The patient did not progress as favorably as could be wished, and was eventually operated upon in New York by Dr. Dennis, a gastrostomy being performed.

Summers's Case—Severe attack of typhoid fever which lasted for twelve weeks. The stricture was found thirty centimetres from the teeth. A filiform whalebone bougie was passed. A gastrostomy followed by Abbe's retrograde dilatation by the string method was the treatment adopted. A bougie was afterwards passed from time to time. The patient progressed very well.

Tinker's Case—Male, aged thirty-one years. A very severe attack of severe case. The original attack lasted three weeks. Then came a relapse with delirium and vomiting. At the end of the sixth week she became conscious and complained of difficulty of swallowing. The stricture was situated thirty-four centimetres from the teeth. It admitted an olive-pointed bougie three millimetres in diameter. It was gradually dilated by means of olive-pointed bougies.

Tinker's Case—Male, aged thirty-one years. A very severe attack of typhoid fever. Was in bed five months. At the end of three months he noticed the first symptoms of dysphagia. The site of stricture was twenty-nine centimetres from the teeth. At the time of observation gastrostomy and retrograde dilatation had been done by another surgeon. Case never presented himself for further treatment.

Dugan's Cases—CASE I. Male, aged eighteen years. Convalescent in eight weeks. In the sixth week he complained of pain in his stomach. He died from want of treatment. Before death he could swallow nothing at all.

CASE II. Male, aged (?). Convalescent at the end of eight weeks, then a relapse. Convalescent again six or seven weeks after this. The site of the stricture was fifteen inches from the upper incisors. Attempts to pass bougies were of no avail. Operation. Gastrostomy, with no attempt at dilatation.

Pyle's Case—Male, aged (?). Prolonged attack of typhoid fever lasting from ten to eleven weeks. Pain and dysphagia during the attack. Situation of the stricture was near the cardiac orifice. A bougie one-sixteenth of an inch in diameter was passed, and then the stricture was dilated by an ingenious system of rubber bags distended with water.

Roberts's Cases—Two cases Both were young men and both had a very long seizure of fever The evidence of stricture was present when solid food was first taken Stricture in both cases was near the cardiac orifice of the stomach Operation was advised and in both cases refused Both patients died shortly afterwards of starvation

I append below a list of references to the cases reported above

REFERENCES

- Packard, F A Philadelphia Medical Journal, January 15, 1898
 Packard, F A Philadelphia Medical Journal, February 12, 1898
 Summeis, J E Philadelphia Medical Journal, October 28, 1899
 Mitchell, J F Johns Hopkins Hospital Reports, Vol viii, p 295
 Pyle Philadelphia Medical Journal, February 3, 1900
 Tinker Philadelphia Medical Journal, March 3, 1900
 Dugan Medical Times, October, 1900
 Roberts, W O Pediatrics, No 1, 1901 Personal communication

LITERATURE

- ¹ Louis Recherches anatomiques, pathologiques et therapeutiques sur la fièvre typhoïde, 1841
² Holscher, August Ueber die Complicationen bei 2000 Fallen von letale abdominal-typhus Munchener medicinische Wochenschrift, January 20, 1891
³ Berg Deutsche Archiv fur klinische Medicin, Band liv, Hefte 2 and 3
⁴ Dopfer Munch medicinische Wochenschrift, 1888, p 621
⁵ Mitchell Johns Hopkins Hospital Reports, Vol viii, p 295
⁶ Ouskow Archives des sciences biologiques, Tome 11, No 1, 1893
⁷ Riesmann, David Philadelphia Medical Journal, September 23, 1899
⁸ Eversman Beitrag zur Lehre von dem peptischen Geschwuren im Oesophagus, Bonn, 1897

ONE HUNDRED CASES OF GASTRO-ENTEROSTOMY FOR SIMPLE ULCER OF THE STOMACH AND DUODENUM¹

BY B G A MOYNIHAN, M S, F R C S,
OF I L E D S

DURING the last few years I have operated upon over 160 patients for diseases of the stomach and duodenum. The cases include examples of malignant disease treated by gastrectomy, partial or complete, or by gastro-enterostomy, of hour-glass stomach, of perforation of ulcers, and of chronic ulcers of the stomach which were in need of surgical treatment for one reason or another.

Up to October 1, 1903, I had performed gastro-enterostomy for ulcer of the stomach or of the duodenum exactly 100 times. In the following paper I have attempted an analysis of this series of cases.

It will be readily admitted that all the records in a long series of such cases are not of equal value. The experience which ripens with each successive case is not at the bidding of an operator at the beginning of his career. The earlier records are, therefore, imperfect, many observations which would now be made were then omitted, as the need for them was not appreciated.

The total number of operations was 100, the mortality two. Eighty-five cases were operated upon for chronic ulcer with intractable dyspepsia, or dilated stomach, with one death. Fifteen cases were operated upon for profuse and recurring hæmorrhage, with one death.

There were fifty-six females and forty-four males. The youngest patient, a female, was aged seventeen, the oldest, a male and a female, were each sixty-two. The average age was thirty-five.

¹ Read before the Clinical Society of London, December 11, 1903

In ten cases the induration around a chronic ulcer was so marked that I have recorded the presence of a "tumor"

In two cases, both females, the patients said they had suffered from stomach troubles "all their lives," and that vomiting was present in early infancy. In the first there was pyloric thickening with complex adhesions, in the second I have noted that the pylorus was like a "thick and rigid tube," in this case there were no adhesions. It is possible that in both a congenital malformation of the pylorus was present.

In fifty-eight cases the presence of a single ulcer or of the scar of a single ulcer was noted. In twenty cases there were two ulcers, in four cases there were three ulcers, and in seven the ulcers are described as being multiple. This statement needs criticising, for I found, as my experience grew, that, on more careful and more extended examination of the stomach on both anterior and posterior surfaces, a second or a third ulcer was frequently found that formerly would have been overlooked. In the earlier cases, five in number, when the anterior operation of Wolfler was performed, the posterior surface of the stomach was not examined. In the last fifty operations more ulcers than one were found in the stomach on twenty-two occasions. Duodenal ulcer was found alone in nine cases, duodenal ulcer with one or more gastric ulcers in thirteen cases. Again, it should be said that the co-existence of duodenal and gastric ulcers was more often noticed in the later cases. The great majority of the ulcers were in the pyloric third of the stomach. It was rare to notice one within the cardiac third. Adhesions which were noticed in twenty-two cases varied greatly in extent and in complexity. In two cases there was a history of the perforation of an ulcer, so diagnosed by the medical man in attendance, in both of these the whole stomach was densely adherent, and it was with difficulty that so much of the stomach was cleared as to allow of a gastro-enterostomy being performed.

Fifteen cases were operated upon for hæmorrhage. Of these one patient, aged sixty-two, died. The only other fatal case was in a man aged twenty-eight. This patient died of a strangulated internal hernia. All the small intestines, with the

exception of about fifteen inches of the lowest ileum, had passed through the opening in the transverse mesocolon into the lesser peritoneal cavity and had become strangled by the margins of the opening. In performing the operation upon this case, I was conscious of having made the tear in the transverse mesocolon larger than usual.

In several of the cases, the patients complained of little more than severe, intractable dyspepsia. It was quite an ordinary history for a patient to say that his or her trouble came on "in attacks," that in the intervals there was comparative comfort, though solid food could not be freely taken, and that relief was sought because the attacks were becoming more serious and the intervals were shorter. Vomiting was often inconspicuous as a symptom, and in some cases the patient said that she had never vomited. On inquiry, it was found that such a patient had been compelled, owing to pain and the sense of impending sickness, to curtail the diet, to omit first one and then another article of food, until little but milk or Benger's food was taken. Vomiting was not present because it was never elicited. A patient who had vomited frequently and in abundance would often be entirely free from any sickness while resting under observation in hospital. In all, vomiting had been observed as a repeated occurrence in forty-four cases.

Hæmatemesis had been recognized, apart from those cases operated upon because of the hæmorrhage, in twenty-one cases. Melæna was observed alone in three cases, in all of which a duodenal ulcer was found. Hæmatemesis and melæna were observed together in six cases, in four of these gastric ulcers alone were found, in two, both duodenal and gastric.

Pain was the most constant and the most distressing symptom. It appeared sometimes before a meal was finished, sometimes half an hour or an hour afterwards. A "hunger pain," a pain eased by the taking of food and appearing two to four hours after the meal, was noticed in cases both of gastric and of duodenal ulcer, and was always associated with hyperchlorhydria.

Hæmorrhage was the immediate and determining cause of

operation in fifteen cases. In all of these there had been symptoms of stomach troubles for a shorter or longer time before the onset of the bleeding. I have elsewhere discussed the various forms of hæmatemesis dependent upon gastric ulcer, and I need only say here that the points which determine one to treat such a case surgically are the recurrence of the hæmorrhage and its quantity. Several of these patients were in a desperate condition. In five of them saline intravenous infusion was employed at the time of the operation, from three to five pints were given according to the patient's needs. The hæmoglobin percentage was 18, 22, 25, 28, and 33 in five of the most serious cases, in the rest it was above this point, or was not recorded. In all these patients, gastro-enterostomy alone, without the excision of the ulcer, was performed, in not one of them was there any trace of renewed bleeding after the operation. There is, without doubt, a very remarkable tendency to spontaneous cessation in gastric hæmorrhage. In hæmorrhage from what is known as an "acute" ulcer, one of the most assured events is the spontaneous cessation of the bleeding. Though the hæmorrhage may be copious and most alarming, it is rarely fatal. In chronic ulcer, the same tendency is noticed, and indeed, in some cases in which an operation has been performed, the ulcer has been found, and the bleeding vessel has been seen plugged with a firm clot. The factor which determines a recurrence of the hæmorrhage is, according to my observation, distention of the stomach. In one case I had to puncture the stomach to let out a large volume of gas before I could manipulate it, and secure it with a clamp as a preliminary step in the performance of gastro-enterostomy. In all the cases upon which I have operated, this distention of the viscus has been observed, and in some it has been phenomenal. It is, I consider, the stretching of the ulcer caused by the distention of the stomach, which is chiefly responsible for the repetition of the hæmorrhage. In one case, not in this series, I have excised the ulcer. The question as to what is the best method of treatment in hæmatemesis treated surgically has been much discussed, and the question remains still unsettled. There are some who advocate the opening of

the stomach and the search for the ulcer. There are others who, ignoring the ulcer, hasten to perform gastro-enterostomy in the belief that this will secure the spontaneous arrest of the bleeding. My own feeling is that if the ulcer is readily found it may be excised, but in any case gastro-enterostomy should be performed as well. For the ulcer may be difficult or impossible to recognize, it may not be single, and if, therefore, one ulcer is excised, another may be the source of the hæmorrhage, and the hæmorrhage continuing may prove fatal. Two cases of this kind, at least, are recorded. That gastro-enterostomy will secure, or at least go far to securing, the arrest of the bleeding (by emptying the stomach, as I think), I submit that my record of cases undoubtedly shows. Whether, therefore, the ulcer be excised or not, a gastro-enterostomy ought certainly to be performed.

In three patients regurgitant vomiting was observed, in one of the patients the vomiting ceased on the tenth day after the stomach had been washed out once, in another, the painless vomiting of bile continued for nearly a year, in the third case, I was dissatisfied with the appearance of the anastomosis as soon as my suture was completed. There had been, about two years before the operation, a perforation of an ulcer in the stomach, and there were the utmost complexity of adhesions all round the stomach, which greatly distorted its outline. There appeared to be a kinking at the point of junction of the jejunum with the stomach, and I was tempted to perform entero-anastomosis then and there. I did not do so, however, but when vomiting of bile commenced, as I feared it would, directly the patient came round from the anæsthetic, I reopened the abdomen and joined the afferent and efferent loops of the jejunum. One hundred and thirty-two ounces of bile-stained fluid were vomited within fifty-four hours of the original operation, after the second operation there was no vomiting. The causes of the "vicious circle" or "regurgitant vomiting" have been difficult to discover. It was supposed that the presence of bile and pancreatic juice in the stomach excited the act of vomiting, but a case of my own, in which, owing to a complete rupture of the bowel at

the duodenojejunal flexure, I had to close the duodenal end and implant the jejunal into the stomach, proves without question that these fluids are harmless. For in this case all the bile and all the pancreatic juice passed into the stomach, yet digestion proceeded as before, and the boy ate well, enjoyed perfect comfort, and gained in weight. The correct explanation of the cause of regurgitant vomiting in some of the cases was first given by Dr Mayo, of Rochester, Minnesota. He showed that if the anastomosis were made at some distance from the greater curvature on either the anterior or the posterior surface, a pool of fluid collected below the opening, and there being stagnant, excited the act of vomiting. He urged that the anastomosis should always be made as close to the greater curvature as possible. Since making sure, in all my operations, that the lower end of the opening was at the greater curvature, I have never seen the vomiting of bile in any case. There are cases, however, to which this explanation does not apply. In these there is an acute kink at the point of anastomosis, and the symptoms are those of intestinal obstruction high in the small intestine. In such circumstances the bile and pancreatic juice regurgitate into the stomach through the pylorus.

Gastric tetany has been observed in greater or less severity in five cases. In three it was slight and affected only the hands, forearms, and the calf-muscles. In two it affected these muscles, the neck muscles and the abdominal muscles, and in both the patients experienced the utmost agony, one of them repeatedly expressing a hope that she might die, to be spared future attacks. In one case, tetany affecting the hands and forearms was observed in a patient on several occasions during the first few days after the gastro-enterostomy had been performed. This patient, who had a very dilated stomach and a markedly stenosed and thickened pylorus, told me at the time that she had never previously suffered from such attacks, but within the last month she has called to tell me that a relative with whom she then lived had reminded her that she had suffered from cramps of the hands with the typical "obstetric position," ten years before. Whatever the cause of gastric tetany may prove to be there can

be no doubt that the disease in its severer forms is a complication of old-standing dilatation of the stomach that can be prevented by the earlier performance in these cases of gastro-enterostomy

Chest complications were seen in three cases, in one there was a sharp attack of pneumonia, in two there was acute bronchitis. In one case, not in this series, of malignant disease of the stomach and in one case of hour-glass stomach acute pneumonia has followed the operation. The symptoms have begun about the end of the second or on the third day, and the acute stage has lasted about one week. Many theories have been suggested to explain the frequency of pneumonia after operations in the upper part of the abdomen. It has been attributed to exposure, to embolism, to the fixing of the upper abdomen by the patient in the unconscious effort to keep the wound at rest, and to the anæsthetic. Much has been written about this subject, but where there are many theories there is little knowledge. My own belief is that the pneumonia is septic in origin, and is due, in most cases, to the inhalation of putrid material from carious or unclean teeth. When a patient who is to have gastro-enterostomy performed comes to the hospital or to the Nursing Home he or she is supplied, as a routine, with a tooth-brush and a bottle of an antiseptic mouth-wash, and instructions are given that the teeth are to be brushed freely every two hours. In addition, all food given is liquid and is sterilized. If the patient is admitted on Monday at noon, for example, five grains of calomel are given on Monday evening, a saline aperient on Tuesday morning, and an enema on Tuesday night. The stomach is washed out on Monday evening or Tuesday morning, as is convenient, the washing being continued until the fluid returns quite clear, and a second washing takes place about an hour before the operation. The operation is done on Wednesday morning. The importance of the cleansing of the mouth and of the sterilizing of the food was conveyed to me by the work of Dr Harvey Cushing, of Baltimore.

After the operation, the patient, when in bed, is propped up in the semirecumbent position by five or six pillows, or by the

bed-rest. If the patient is very ill and in urgent need of fluid nourishment, water, milk, or other fluid is given at once in small doses quickly increased. Saline enemata of five to six ounces, with or without brandy, are given every four hours, and a simple aperient enema is given every twenty-four hours. The toilette of the mouth is still carefully supervised.

The anterior operation of Wolffei was performed in five cases, the posterior of von Hackeri in ninety-four cases, Roux's operation in one case. My choice of this last method was due to the fact that, owing to the perforation of a duodenal ulcer for which I had operated several months before, there were many adhesions crippling the stomach and warping its outline. In a previous almost exactly similar case, already mentioned, I had been compelled to reopen the abdomen and perform an entero-anastomosis. In any case of this kind, in future, I should adopt Roux's procedure. It is ideally perfect as a method of gastro-enterostomy. It reproduces almost exactly the normal conditions. Its sole disadvantage is that the time necessarily expended in the operation is at least ten minutes longer than in an ordinary posterior gastro-enterostomy. I am so satisfied, however, with the results of the posterior operation, and with the perfectly uneventful course of the great majority of the cases, that there does not seem to me to be any need for the routine adoption of Roux's method.

In ninety-two of the cases, the result of the operation has been from the first as satisfactory as could be wished. Appetite has soon returned, and food has been taken in any quantity with relish. All these patients have gained in weight, the gain varying in amount from seven pounds to four and one-half stones. In the remaining six cases the after-history has not been so good. In every one of these hyperchlorhydria was pronounced before the operation, and has proved a source of pain and inconvenience afterwards. Of the six patients, three have improved greatly under medical treatment continued for three to five months, and are now quite well; one is almost well, and two are still under treatment. The last three have all been operated upon within the past eight months. It is possible that in some of these cases,

owing to the excess of free hydrochloric acid, the mucous membrane in the distal limb of the jejunum has been digested, forming a peptic ulcer, and that this has caused some of the symptoms from which the patient has suffered. The six cases are the only ones that have not been completely successful. They have shown me that when hyperchlorhydria is present as a prominent and enduring symptom, some preliminary treatment by diet and alkalies may be desirable.

In two cases the condition was diagnosed before operation as malignant, and the appearances found at the operation were taken as confirming the diagnosis. Yet malignancy is disproved by the fact that both patients have gained over three stones in weight, and remain perfectly well, though the operations were done in June, 1900, and in January, 1901. In one case, not included in this series, the induration at and near the pylorus was supposed to be simple in character, but the subsequent course of the case has shown that the condition was malignant. This may have been an error of diagnosis, or the case may be an example of "ulcus carcinomatosum," of the implantation of cancer upon the edge of a chronic ulcer. This case occurred early in my experience. I do not think that the differentiation between simple and malignant conditions in the stomach causes me any difficulty now.

In three cases, not included in this list, I performed pyloroplasty. The last operation was done in January, 1901. I do not intend to perform this operation in any subsequent case. Gastro-enterostomy is, in my judgment, a much more satisfactory method of dealing with any condition of pyloric stenosis. (This criticism does not apply to Finney's operation of gastroduodenostomy or pyloroplasty.) The operation of gastro-enterostomy is so safe and its results are so good that I cannot doubt that it is the most desirable operation in all cases of chronic gastric ulcer. Its success depends in no small measure upon care in the preparation of the patient, speed in operating, the choice of a method which is simple, and which does not need a long exposure of viscera, and upon many details in after-treatment. Excision of an ulcer is perhaps desirable in some special instances, but the

main indication to be fulfilled is drainage of the stomach, and, to secure this, gastro-enterostomy should always be performed. In many cases in this series the patients were extremely ill, wasted, and enfeebled to the last degree, and it was only by the exercise of the greatest care that the operations proved successful. There are at least a dozen cases that one would not have been surprised to lose. Now that the mortality is reduced to so small a figure as 2 per cent, the surgeon may not unreasonably expect that, from being a last and sometimes desperate resource, gastro-enterostomy may be considered as a method of treatment worthy of consideration in a much earlier stage of chronic ulcer of the stomach.

POSTOPERATIVE PNEUMONIA, WITH EXPERIMENTS UPON ITS PATHOGENY

BY W LOUIS CHAPMAN, M D ,

OF PROVIDENCE, R I

SINCE this is one of the few subjects which is not adequately covered in medical literature, and since postoperative pneumonia has almost invariably been attributed to the anæsthetic no apology is needed for inviting the attention to a brief discussion of the subject, to views taken at a new angle, and to a few experiments which may have some clinical significance

No complication is more dismaying to the surgeon or more disastrous to the patient, and it would seem that any light which may be shed upon its etiology or suggestions as to its prevention should be most welcome. Occasionally, after an operation performed with the requisite speed and technical skill, the temperature rises with an initial chill, increased pulse-rate, and systemic depression which at first suggest sepsis, and show for their only cause a percussion area on the chest, a few moist or crepitant râles, all progressing rapidly to a fatal end

What, then, may be the causes of this complication? What is there in the surgical state which renders a patient more susceptible to pulmonary infection at this particular time? Is it the ether, the reduced condition of the system caused by those factors which make an operation necessary,—a cold operating table with cold water for “washing up”? Is surgical pneumonia different from any other? Did pulmonary disease exist before a pneumonitis developed, or was there a particular opportunity for an infection? All these questions are interesting and important in the *rationale* of an individual case

Of especial interest, however, is the possibility of a pneumonia already existing in a latent state or in a typical form. Knowing as we now do the great frequency of these forms of

pneumonia as contrasted with the frank, undoubted variety, and the great commonness of cases which have at first but little elevation of temperature and practically no physical signs, is it at all remarkable that occasionally consolidation shows itself a few days after an operation of no particular severity or danger? Again, it is impossible to overlook the element of chance in reviewing the likelihood of pneumonia after an operation. We do not as yet know whether the prevalence of pneumonia at certain seasons is due to climatic changes, a state of particular virulence of the bacteria, or both, and it seems that nothing could be more unreasonable than to ascribe to the anæsthetic a disease quite prevalent among those not affected with surgical ailment.

Statistics are of but little value in an inquiry into the etiology of this disease. That different observers found it to occur once in a certain number of cases throws no light whatever on the subject further than to show that it occasionally does occur after an operation. Prescott, in reviewing 40,000 cases at the Massachusetts General Hospital, found but three cases, Silk reports thirteen in 5000 surgical cases, and Anders, in a review of 12,842 surgical cases, found thirty. Kelley has seen eight cases in 1800 administrations of various anæsthetics, and is of the opinion that coryza as well as bronchitis predisposes to the complication. The writer, in a necessarily limited experience, has a knowledge of five cases, and is of the opinion that the condition is of much greater frequency than these reviews would indicate.

Various vasomotor changes result from the necessary circumstances of an operation. Conspicuous among these is the exposure of the body surface to a temperature of 70° F. or under, cleansing solutions may be cold, and if the clothing be wet the patient is swathed in a cold poultice at a time when he should be protected from such an influence. We have in these precisely the same factors which are accounted as causes of colds, respiratory and the so-called rheumatic disorders with the added changes in the peripheral circulation incident to the anæsthetic. These vasomotor changes are prime features in surgical shock.

and for this reason a warm bed with heaters should await the patient, and be maintained until circulatory equilibrium has become re-established. If the operation be upon a patient reduced by long-continued illness, external or concealed hæmorrhage, or if there is a possibility of collapse or death on the table, everything should be done to maintain the body temperature. Among the various means to this end the hot-water mattress is of particular importance.

As to the ability of ether to produce pneumonitis, some affirm it, others deny it, but all dread it. For years the necessity of careful dosage in anæsthetics with the view of reducing shock, irritation, and vomiting to a minimum has been urged, and, although it would seem that the application of these principles would lessen the possibility of postoperative bronchitis or pneumonia, we have as yet no convincing data that ether is a prime or direct cause of pulmonary complications. Indeed, it is claimed by some that pneumonia occurs quite as frequently when local anæsthesia is used. Experimentally, it is not at all easy to produce pneumonia. Aufrecht could not produce it in healthy rabbits by subcutaneous or intrapulmonary injection of pneumonic sputum, and after an interesting series of experiments concludes that a pre-existing pathological lesion is necessary for the deposition and multiplication of pathogenic bacteria. Grave pathological conditions (abscesses) and death may be caused, but not pneumonia. That bacteria are found in the bronchioles, and even in the finest ramifications of the air-passages under certain conditions, cannot be doubted, for Klipstein found that, although they were normally absent from the trachea, bronchi, and lungs of cats, dogs, and rabbits, they might be found in abundance after etherization. In the experiments of Lindemann, carmine was introduced into the mouths of rabbits, and after the animals had been etherized, particles were found in the smaller ramifications of the bronchi, having been carried there by the violent inspiratory efforts incident to the etherization. The writer also finds bacteria in the lungs of healthy rabbits.

It is fair to presume, however, that a theoretically perfect

epithelium is able to resist the ordinary invasions of bacteria and it seems reasonable to suppose that any damage to the tissue would render the individual more susceptible

Surgical pneumonia then may be divided into two classes, —one in which infectious particles are drawn into the lungs by the violent inspiratory efforts incident to anæsthesia, the other in which organisms of particular virulence find soil suitable to their growth and multiplication

I have the honor of presenting a brief account of a few experiments upon the irritant effects of ether. It is a fundamental principle in pathology that a perfect tissue is less liable to infection or other degenerative changes than one previously injured or diseased. Cancer invades abraded and cicatricial tissue, the diphtheria bacillus finds a fruitful soil in the catarrhal pharynx, pneumonia and bronchitis more quickly attack those with pre-existing pulmonary lesions, and sepsis attacks abraded rather than unbroken surfaces. Without elaboration of the reasons why this is so, it may be stated that any evidence that the inhalation of a vapor produces structural changes in the lungs, thereby opening increased possibilities for bacterial lodgement, may serve as an explanation of postoperative phenomena. The inhalation of silicious particles causes minute wounds upon which tuberculosis may develop, perhaps the minute hæmorrhages which we shall see take place in the lungs in prolonged or careless anæsthesia, may serve for the subsequent development of pneumonia if the specific bacteria be brought to such lesions before they are healed. With this in mind, I have made a number of experiments with rabbits to see if possible whether the irritant effects of ether reach down into the lung tissue, or are confined to the larger bronchial tubes and whether etherization increases susceptibility to pneumonic infection. Securing first a normal lung by decapitating the rabbit for suffocation or brain puncture causes engorgement of the pulmonary vessels with rupture of the alveolar capillaries, sections were prepared by fixing and hardening in Zenker's solution and alcohol and embedded in paraffin. Sections were for the most part five microns in thickness and transverse to the tubules. The next

step was to observe the effect of ordinary etherization on the rabbit's lung, and to this end ether was given by an inhaler for half-hour periods on three successive days, the lung being then prepared for observation as that of the control normal rabbit

In order to see if a normal rabbit would acquire pneumonia if given ample opportunity, it was caused to inspire an atmosphere saturated with the diplococcus pneumoniae, and to ascertain if a rabbit previously etherized was more susceptible, it was caused to inhale the same atmosphere

To observe the effect upon a capillary net-work similar to that of the lung, the web of the frog's foot was made use of, and to learn the effect of ether itself on the lung it was injected directly into the lung tissue of the living animal by a hypodermic syringe

I *Effects of Ether on the Frog's Web*—In observing the frog's web before, after, and during exposure to ether it was found that the effects of liquid ether and its fumes were the same in kind, the former acting more quickly. Macroscopically, the foot presented the appearance of intense congestion, dark and livid. Microscopically, it was found that all circulation had ceased, the blood in the vessels having become stagnated and presenting a mass of corpuscles packed so closely as to seem homogeneous. The larger blood-vessels could be made out, their contour unaltered, but the smaller capillaries seemed identical with the tissue. After a time, however, if the ether be removed, the circulation gradually asserted itself, feeble impulses could be detected in the arteries, which then become larger in caliber, and little by little with increasing impulses the solidified mass becomes broken up and is fluid again. Nearly an hour is required to completely restore the circulation after five minutes' exposure of the foot to ether fumes. Immediately upon the appearance of the slightest circulation, leucocytes appear in the lumen of the vessels, proceeding from the perivascular tissue, and these associate themselves with the vessel wall, adhering to it in spite of the ceaseless impact of the red corpuscles in the blood stream. In a few minutes these have

formed a complete lining for the vessels, and gradually the contour of the individual corpuscles is lost and a new endothelium is formed. In occasional instances the capillary wall was ruptured, so that the corpuscles poured out in a broad stream unrestrained by lateral walls, forming a true subcutaneous hæmorrhage easily seen by the unaided eye. To show that these phenomena were not due to refrigeration from the evaporation of the ether, ice and ice water were applied to the frog's foot, but only a slowing of the blood current was observed. The restoration of the circulation after as brief an exposure as five minutes is not always complete, some of the vessels may remain clogged and never become cleared, others regain their function for a time, but later fill up with agglutinated reds. If the exposure is as long as ten minutes, the tissue is killed and the circulation entirely destroyed, and after a few hours the integument peels off in strips over the entire area of exposure. The tissues underneath are devoid of circulation, and in a few days the flesh sloughs off, leaving only the skeleton.

We may conclude, then, that in the frog's capillary web ether causes arrest of the circulation, rupture of the blood-vessels, and in general phenomena of an inflammatory and hæmorrhagic nature with death of the exposed tissue, and that these effects are specific to ether and not the result of refrigeration. And it is interesting to note how short an exposure will cause these changes. From these observations, it was predicted that the changes produced in the lungs, if any, would be of the nature of hæmorrhages, a surmise that was fully realized.

II *Effects of Ether upon the Lung*—When ether is injected into the lung tissue of a live rabbit, the animal emits a few frightened cries and gives a few struggles, after which it remains quiet. For three or four minutes there is slight disturbance of equilibrium, but at no time is there anæsthesia. Râles appear at once in the chest, and are observed with stethoscopes of various kinds, the Bowles being the most satisfactory. The respirations and heart are

greatly accelerated, being doubled in velocity and of the ratio of one to two. Ten minutes after the injection of five minims of ether the pupils react to light, ether can be detected in the expired air, the respirations are labored, and the nostrils dilated, giving the characteristic appearance of air hunger. After this there is but little change in the animal's condition until its death, which occurs some ten hours later, the pulse remains about 200, the respiration 100, there is diminished respiratory movement of the affected side, a percussion area can be made out over the site of the injection. The respiration is distinctly bronchial over this area, the râles being loud and of all grades, from small sibilant to noisy rhonchi.

Necropsy upon this animal shows the tissue around the site of injection to be a mass of hæmorrhagic tissue which is solid, sinks in water, and is of a dark red color. There is a large mass of clotted blood in the cavity, adherent to the lung tissue and evidently proceeding from it rather than from the chest wall. The other lung shows areas of ecchymosis, but is otherwise normal, and a tendency towards those features found nearer the site of injection.

Microscopically, it is found that the structure of the lung is so completely changed as to leave but little resemblance to the normal. As seen by the microphotograph (Fig. 2) there is hardly a vestige of normal lung tissue. Instead there is a homogeneous mass of agglutinated red blood-corpuscles dotted with nucleated cells which are leucocytes and cells from the alveolar walls. The more remote from the point of injection, however, the more normal does the tissue appear, and it is possible to select areas which can be recognized as lung tissue. Even in the other lung we find alveoli filled with hæmorrhagic exudate, thickened walls, and nucleated cells proceeding from them into the spaces. The exudate in this experiment is of two kinds,—one of broken-down lung tissue with connective-tissue cells closely packed together, the other of a hæmorrhagic nature, consisting of blood extravasation agglutinated into a finely granular homogeneous mass.

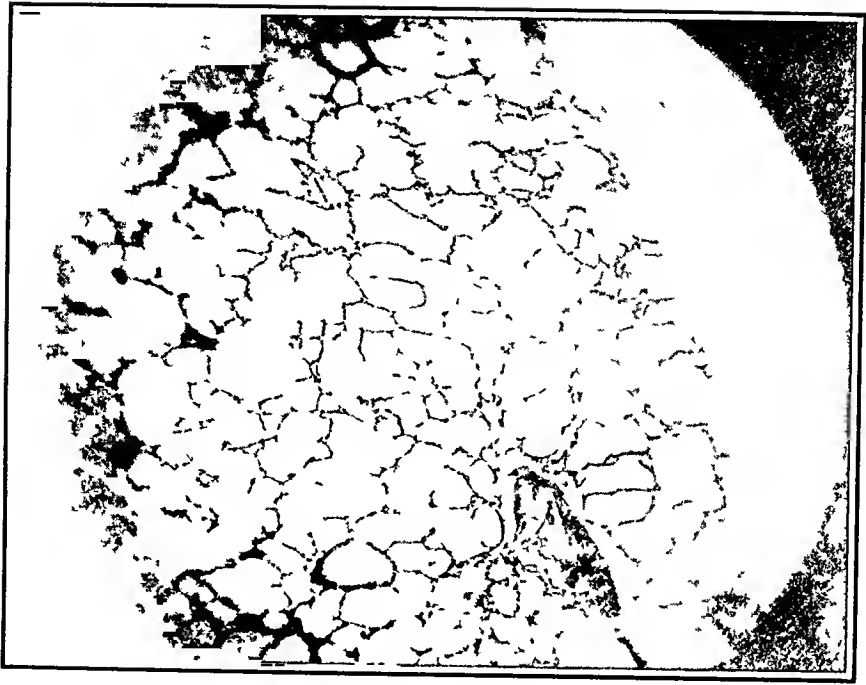


FIG 1—Section of lung of normal rabbit $\times 87$



FIG 2—Section of rabbit's lung into which ether has been injected Lung structure is completely lost, there are no vestiges of alveoli or walls, the almost homogeneous mass is composed of red and white blood-corpuscles with nucleated cells of the destroyed lung tissue



FIG 3—Section through hemorrhagic area of an etherized rabbit. Showing only suggestions of alveolar structure, the blood vessels having ruptured and the alveolar walls having become agglutinated. This section is longitudinal to the alveolar ducts.



FIG 4—Etherized rabbit caused to inhale vaporized culture of pneumonia germs. Almost complete consolidation of the lung. The alveolar walls may be made out, but the spaces are filled with exudate. The walls are engorged and reds may be seen proceeding from them.

III *The Effects of Ether Anæsthetization*—*Macroscopically*, the lung of a rabbit previously anæsthetized shows dark red mottlings which for the most part are superficial. These are distributed over the surface of the lung and comprise a third of its external area. These are the areas over which râles were most distinctly heard during the etherization. It was thought, inferred from the observation of the frog's circulation under ether, that these mottled areas were hæmorrhagic in their nature, and microscopic examination shows this to be the case. The alveoli are swollen and full of corpuscles, the bronchial tissue is congested, and in many cases the corpuscles may be seen proceeding from the tissue into the alveoli and peribronchial spaces (Fig. 3). Experiment readily shows the increased susceptibility of rabbits to the irritant effects of ether with successive etherizations, for when one is carefully anæsthetized râles appear in the chest in about a half an hour. If, then, this rabbit be undisturbed for two or three days and again anæsthetized, they appear in about fifteen minutes. A third anæsthetization causes râles and rhonchi to appear in five minutes or less. It is interesting to note, also, that the forcing or crowding of the anæsthetic causes these features to appear in a very much shorter time. Furthermore, it is found that the microscopic changes in the lungs vary from the condition of congestion of the alveoli to actual intra-alveolar hæmorrhages, according to the care taken in the etherization, very short etherizations causing but little change in the lungs.

IV *Etherized Rabbit Plus Pneumonia Culture*—To learn if a rabbit previously etherized would acquire pneumonia, or if an infection would have any effect upon the lesions caused by ether, one was etherized for half an hour on three successive days, and in the intervals it was caused to inspire an atmosphere laden with Fraenkel's diplococcus pneumoniae. Cultures of this organism were very kindly furnished me by Dr. Augustus Wadsworth, of Columbia University, and were administered by diluting with water and vaporizing in an ordinary nebulizer. To avoid scattering the bacteria, the rabbit

was caused to inhale through an aperture in a box which closely fitted its nose, and the vapor was introduced through a small aperture at the opposite end. This animal was certainly ill, refused its food, and its rate of respirations was distinctly increased. No râles could be detected, and the respiratory murmur was slightly increased. There were no percussion areas.

Macroscopically, the lung presents all the features of that already described as incident to etherization, but all are advanced and intensified. Its surface is studded with areas of irregular outline of a dark reddish-brown color, the peribronchial tissue is almost black and nearly solid, parts of the lung do not crepitate and nearly sink in water, and the abnormal tissue is not superficial, but massive, extending deeply into the lung tissue.

Microscopically, the findings are most interesting and fairly well shown in the microphotograph (Fig. 4). In these sections we have all grades of pneumonitis, from mere congestion, with but slight change from the normal, to actual consolidation of lung tissue. Selected areas show the typical picture so often seen in cloupous pneumonitis,—the alveoli preserved in outline, but completely filled with exudate, which in some cases rests upon a delicate reticulum. The areas around the bronchi show a marked degree of peribronchitis, and the lumen of the bronchi are for the most part filled with exudate. When stained by Gram's and other methods for bacteria and capsules, an organism is found which is identical in morphology and staining properties with that used in the experiment.

The significance of this experiment depends not only upon the findings of the preceding one, but also upon those in a

V *Normal Rabbit caused to Inhale Culture*.—This animal, although it showed slight lassitude for three days, did not refuse its food, and showed no elevation of temperature or increase in respiration.

Macroscopically, the lungs showed no abnormality whatever. There was no mottling, no signs of hæmorrhage, no change in the normal crepitation.

Microscopically, the sections showed a thickening of the alveolar walls, but without consolidation of tissue, peribronchitis, or exudate of any kind. The bacteria used in the experiment was occasionally found in the alveolar spaces and walls. In this animal we have a nearer approach to the normal than any in the series, and it is quite easy to find areas which show no abnormalities whatever.

VI Finally, with the idea of learning if complete resolution took place in the lung of an etherized rabbit not influenced by infection, one was etherized until râles appeared in abundance, and after two weeks this animal was killed. It was found that the lungs showed the hæmorrhagic areas partially resolved, but still distinct, and it was deduced that some time must elapse, in the rabbit at least, before the lung is again normal. It would be an interesting and practical problem to make a series of experiments along this line with a view of determining the amount of time required and the manner in which resolution takes place.

The following conclusions seem justifiable and may be defended:

1. Prophylaxis. Care in ether giving lessens shock and respiratory irritation, which reach their maximum when an unnecessarily large amount of ether is given.

2. The disinfection of the mouth and oropharynx by peroxide before operation is a rational precaution.

3. Adequate air space is of even greater importance in surgical wards than in medical.

4. A careful auscultation and percussion of the chest should precede every operation, and if there be signs of disease operations of election should be postponed until the chest condition is more favorable.

5. A complete clinical record of all cases of postoperative pneumonia, together with a record of the previous state of the patient, is most desirable, and such records will in time greatly enrich our incomplete knowledge of the factors which predispose to the complication.

6 It is possible to demonstrate experimentally the lesions produced by suffocation and etherization, and the same philosophy which explains postoperative pneumonitis may be applied to that which occasionally follows poisoning by carbon monoxide and illuminating gas

THE DIAGNOSIS OF ABSCESS OF THE LIVER

BY THOMAS L. RHOADS, M.D.,

Medical Department, United States Army

ABSCESS of the liver occurs in a variable percentage of cases dying from amœbic dysentery, according to the statistics of different investigators. Woodward, for example, collated the autopsy records in 3680 dysenteric subjects, and found 21 per cent having abscess of the liver. Boston, in a similar collation of 2430 dysenteric autopsies, found 20 per cent with liver abscess. The annual report of the Sanitary Commissioner with the Government of India for 1894 shows that 35 per cent of the European soldiers who died from dysentery in India had pus in the liver. These statistics, based upon autopsy findings, while interesting from the pathologist's stand-point, and instructive in emphasizing the importance of one constantly bearing in mind the possibility of liver-pus complication in dysenteric cases, do not however reveal the true relation between the disease dysentery and its most common complication or sequel, for they do not include the whole mass of dysentery cases treated during the time, and in the locality, in which the disease was rampant, and from which the autopsy records were made. The figures do not include the number of cases that recovered, with the number that succumbed to the primary disease or its complication, and therefore do not give the surgeon a correct idea as to the frequency with which he may expect a suppurating liver in his dysenteric patients. In order to ascertain this relative frequency of abscess formation, while in charge of the surgical work, I investigated the records of the First Reserve Hospital Manila, P. I., in 1901, the data covering a period of over two years, and found that liver abscess occurred in slightly less than 5 per cent of dysentery patients among the American soldiers in the Islands. A like computation was recently made by Dr Craig, at the Army General Hospital, Presidio of San Fran-

cisco, the principal receiving hospital in the United States for patients from the various military hospitals in the Philippines, and he finds that the percentage of liver abscess complication of amœbic dysentery cases treated in this hospital during the past five years is approximately the same,—5 per cent. This number then (one abscess of the liver to every twenty cases of amœbic dysentery) may be accepted as the relative frequency with which we have to deal with liver-pus complication in patients who have contracted dysentery in the Philippines, and in view of the increasing traffic between our country and the Island ports, with large numbers of dysentery patients returning yearly to our shores, the subject will be of some interest to physicians under whose care these cases eventually come for treatment.

The estimate given has no reference to the type of dysentery indigenous to our own country, for it is a well-known fact that abscess of the liver is a rare concomitant of dysentery contracted within the limits of the United States. During my service as Assistant on the clinical staff of one of the largest hospitals in an Eastern city, covering a period of nearly five years, I recollect but one case of abscess of the liver, of unknown origin, treated in that institution. Neither has the estimate any reference to the disease contracted in any other tropical country than our Island possessions, for, as Manson has pointedly stated, drawing his conclusions from a large experience in the study of dysentery in warm climates: "Even in hot countries the dysentery of some places is more apt to be followed by liver abscess than is the dysentery of other places," and in Egypt and India, for example, where the disease is particularly common, it may be that hepatic abscess is a more frequent complication than our experiences have shown it to be in the Philippines. Those patients having dysentery contracted in the tropics and who come to us for treatment, will however be principally those returning from the Islands, and in 5 per cent of these cases we can count on liver infection.

The ability to recognize this liver complication is of course of paramount importance to the surgeon who would deal suc-

cessfully with such cases. It is hardly a credit to us to read that, out of so many hundreds of dysenteric cases coming to autopsy, a large number are discovered by the pathologist as having liver abscess unrecognized on the sick-bed. Such findings will be less common as our knowledge of the disease increases, and the liver condition is diagnosed while it is still operable. That this is possible in every case has been proved by the experiences of the staff at the Army General Hospital in this city, where since the fall of 1902, to my personal knowledge, among seventy odd cases that have died from dysentery, but one case of liver abscess found its way to the post-mortem table undiagnosed, and this was a suspected case, but unwarranted dependence on the aspirating needle as a diagnostic means led to delay in decisive action until the patient succumbed to pleural rupture. During this period twenty-four cases of liver abscess were operated upon.

The diagnosis of liver abscess can best be set forth by describing a typical case, keeping in mind at the outset that we are dealing with a complication, or a sequel, of dysentery and that the pus formation in the liver never antedates the pathological lesion in the bowel. In the majority of cases a history of a previous dysenteric attack can be elicited from the patient, but the absence of such history should not mislead us into a wrong conception of the relationship between the two diseases. Extensive dysenteric ulceration may exist in the bowel, and in some instances give rise to no active subjective symptoms whatever, so that the patient may be unaware of his intestinal condition, or slow forming minute intestinal ulceration, with slight change in the character of the stools, may pass unnoticed by the patient until he presents himself with hepatic discomfort. I have witnessed the post-mortem dissections of patients with multiple abscesses in the liver who denied ever having had any looseness of the bowels, or ever having seen any evidence of blood in the stools, yet the characteristic ulcers were prominent in various portions of the large bowel and ileum. These cases are the dysenteric analogues of "walking typhoid" patients fre-

quently met with, and in whom, notwithstanding the latency of symptoms, the intestinal lesions exist

The failure of the surgeon to at once elicit the history of an antecedent dysentery may also be due to a faulty recollection or a misconception on the part of the patient which leads him to make erroneous statements that can be corrected by careful inquiry into past habits, a circumstance which was impressed upon me on several occasions, when patients presenting themselves with a suspicious liver condition denied ever having had a previous dysenteric attack, yet close questioning brought forth the information that a slight attack of "diarrhoea," or a "looseness of the bowels," occurring in the tropics, dated back one, two, or four years, and was entirely forgotten. Again, the puzzling autopsy reports of cases of amœbic abscess of the liver occurring independent of, or in the absence of, any bowel lesion may find explanation in the probability that dysenteric ulcerations of a small and superficial character are often either not sought for or are overlooked during evisceration of the subject, or, that having gone on to resolution, the minute scars pass unnoticed by the pathologist as he flushes the gut under the water-tap searching for macroscopic lesions. So that in those cases of liver abscess where a history of, or evidence of, antecedent dysentery is not obtainable, it must not be inferred that the disease never existed. On the contrary, I am prone to believe that all cases of amœbic abscess have a causal factor in bowel ulceration.

The case with liver abscess belongs to one of two classes he is either a patient returning from the tropics suffering with chronic dysentery, and in whom the intercurrent hepatic lesion is discovered during the routine examination on his arrival, or, having returned from the Orient in fairly good condition at some previous time, a month, a year, or several years it may be, he now seeks relief from a gradually increasing hepatic disturbance, with a history of dysentery that may or may not be forthcoming. The one who is still suffering from a chronic dysentery on admission presents the well-known clinical aspect of this disease, plus the symptoms dependent upon the liver

lesion, and is therefore in a more precarious state than the one who was cured of his dysentery and who has enjoyed a period of respite from invalidism, but who is now suffering from its perilous sequel. The case in whom the bowel condition is in abeyance will have more clearly defined symptoms and will be more readily recognized, and once the local condition in the hepatic region is thoroughly understood the symptoms and signs dependent thereon may easily be isolated in patients in whom the abscess is a concomitant affection.

In describing a typical abscess case I have to take exceptions to the clinical picture of this disease presented by the leading European authorities on tropical diseases and their American editors. The picture drawn by these authors is that of a patient in whom the pathological process in the liver is far advanced, with neighboring structures seriously involved, and the abscess on the verge of rupture. To advocate delay until the abscess had reached such proportions before a diagnosis is reached is dangerous teaching. One would not consider it permissible to withhold diagnosis in a chronic appendicitis case under treatment until the organ was about to rupture and empty its purulent contents into the peritoneal cavity, and there is no more reason why the existence of pus in the liver should not be determined before the disease has advanced far and reached dangerous limits. The clinical features of the abscess in its incipient stage are sufficiently prominent to make it possible to recognize the condition early, and the efforts of this paper are directed to this end.

One is impressed at the outset on examining the patient that he is quite ill. He looks emaciated, usually from ten to thirty pounds under weight, his features are drawn and set, giving him the haggard expression of one who has suffered continuously for some time. His complexion is the ashy-brown color common to the chronic dysenterics who have seen several years' service in the tropics. His eyes are lustreless, and he looks from one object to another slowly and in a disinterested manner. He walks erect, but lacks activity. On questioning him in reference to his illness, he will state that for some weeks

past he has had an unaccountable languor and depressed spirits, has lacked interest in his surroundings, and feels irritable under the stress of work. He complains of feeling feverish towards evening, and is inclined to remain near a stove most of the time, but denies having had chills. His breath is foul and he has a dull headache, not very severe, but constant in the temporal or frontal region. His principal complaint, however, is a sense of weight and dragging in the right hypochondrium. He will give a history of a dysenteric attack in the tropics some months or years back, and during his service beyond the seas he was a moderate user of alcohol of mixed variety, and not always careful in the selection of food. With this information he will be put to bed, a four-hour temperature is outlined, a liquid diet is prescribed, and a copious dose of epsom salts (sixty grams) administered, even in the presence of dysentery, to deplete the abdominal viscera and thus facilitate examination on the following day. In the meantime a differential blood count will be made, the stool will be examined for amœba and other parasites, his urine will be investigated, and if he has a cough with expectoration, his sputum will be examined microscopically. At the end of twenty-four hours a physical examination of the patient is made, the laboratory reports compared, and the following diagnostic points are searched for, set down in the order of merit:

1. Liver enlargement, with local tenderness and pain. The local liver condition, next to the dysenteric history, is naturally of first importance. With the patient in a prone position, lying on his back with his thighs flexed, the liver dulness is outlined by percussion.

In a case seen early in the course of the disease, or when the abscess is still small, the normal liver dulness may be increased but slightly,—a finger's-breadth on the upper or the lower border. In two cases on which I operated, having single abscesses the size of a hen's egg near the outer border of the right lobe, there was no apparent liver enlargement on percussion. In two other cases having abscesses of the same size,—one near the outer and posterior surface of the right lobe, the

other in the lobulus spigelii,—there was a slight enlargement, in the first case a finger's-breadth above the normal dome outline, in the second case below the costal margin on the right side towards the median line. In the majority of cases that appear for treatment, however, the increase in dulness is marked from two to six centimetres, even in abscesses of comparatively small proportions and without adhesions. The increased percussion dulness will generally be outlined by an arching of the upper border, and will be most prominent between the right nipple line and the anterior axillary line. It frequently extends to the level of the sixth or fifth rib in this locality, and shades off in a downward direction posteriorly to the level of the eighth or ninth rib, near the spine. In one-third of cases dulness extends below the right costal border. In such cases the patient is told to take a deep breath and to exhale it rapidly with his abdominal wall relaxed, and the surgeon's fingers are pushed gently but firmly below the ribs on the under surface of the liver as far as possible, to see if any mass can be discovered that would change the normal flat contour of the inferior surface. In some cases this fact can be ascertained, and the amount of pain elicited, and the degree of wincing exhibited by the patient will also be of diagnostic value. At times, in the effort to carry out this procedure, the surgeon will encounter a marked rigidity of the right rectus muscle in the epigastric region, but this is generally a temporary spasm, and the muscle will relax after several efforts at posterior pressure, and the patient's confidence is gained. This temporary reflex spasm must not be confounded with a fixed rigidity,—a later sign of liver abscess on the under surface in this region, and which means that the abscess has reached the surface of the organ at some point in the neighborhood, and the peritoneal surface is involved in the inflammatory process.

Increase in dulness, then, either towards the nipple or below the right costal border, is the rule in these cases, and signifies (other signs being equal) a pus collection in the right lobe,—the most common site of abscess. Seventy-five per cent of cases on whom I have operated have had abscesses in the right

lobe, Craig reports the same percentage of right lobe infection in post-mortem work during the past five years. Roux gives the number 70.8 per cent from a collective investigation at autopsy, so that the usual site of infection of those who die with the disease, and those who are operated upon and recover, is the same. The reason abscess of the liver occurs more frequently in the right lobe finds its explanation in the laws of normal physics. The amoebæ and other bacteria pass through the ulcerated surface of the intestine into the mesenteric veins and enter the vena porta, which passes upward to the under surface of the right lobe of the liver, entering the organ through the transverse fissure, where it divides into the right and left branches, supplying the corresponding lobes. The right branch, from its direction, is really the continuation of the main trunk, and being the larger, shorter, and more direct route for the blood stream, the more voluminous and swifter current will carry a preponderance of the bacteria or emboli containing them into the capillaries of the right lobe. Single abscess of the left lobe is a comparatively rare occurrence, and increased percussion dulness limited to this lobe is accordingly an infrequent phenomenon. When the left lobe is enlarged, the dulness is increased downward in the epigastric region, to the left of the median line, and approaches the splenic area. When dulness over the left lobe is markedly increased, it is generally in association with an increase in dulness over the remainder of the organ, a sign linked with the condition of multiple abscesses throughout the gland.

Inquiry is made as to the presence of pain. In the majority of cases the patient will complain of considerable discomfort or a dragging sensation in the hepatic region, and when asked to locate it he will usually place the palmar surface of his entire hand over the area where this pain is located. Although not a specific indication, this gesture will give an idea as to the area of the liver probably involved. If he places his palm near the rib margin, it may be presumed that a lesion exists near the under surface of the right lobe, if he marks an area higher up on the chest wall, it implies that the trouble

exists towards the upper surface of this lobe. This discomfort is not always present, and may not be noticed by the patient while the body is at rest, but on walking or engaging in any exercise with jarring movements, the discomfort will assert itself in marked degree.

Sharp, stabbing pains will be complained of by some patients, especially on taking a deep inspiration. The site of this acute pain will be indicated at the point of the finger, and when the patient gives us this information we may know that we are dealing with a more or less advanced case, that the suppurative inflammation has reached the surface of the organ, that adhesions are forming or extending between the liver capsule and the peritoneum at this point. Occasionally these acute lancinating pains will be diffused over a wider area, and the patient will not be able to locate the point of greatest tenderness himself. Careful search by the surgeon with the point of his finger in an intercostal space, or deep down on the under surface of the liver, will discover it. This point is a valuable diagnostic sign.

2 Next in importance is the temperature. If the case be a pure amoebic infection, with the abscess limited to the parenchyma of the organ and is unaccompanied by adhesions, the evening temperature will average 100° F, the morning temperature dropping to a range between 98° and 99° F. Forty per cent of cases appearing for treatment will have an evening temperature hovering around the 100° F mark. This is true of large abscesses as well as small ones without mixed infection. If the temperature rises to 102° F, or above, in the evening it means that we have, in addition to amoebic infection, a staphylococcus or a streptococcus or a bacillus coli invasion, the morning temperature in these cases being about the same as in a distinct amoebic infection. This clinical experience has been confirmed by examinations of the pus in the laboratory. In over half the number of cases operated upon, the examination showed a mixed staphylococcus and streptococcus infection in the pus scrapings from the abscess wall. In three cases the

bacillus coli was found, but it existed in conjunction with other bacteria. If the case be a pure amœbic infection primarily, but appears for treatment late in the course of the disease, the pus accumulations having reached the surface of the liver and invaded the neighboring structures, the temperature range will be similar to that found in a mixed infection, and is presumably due to the fact that the pus organisms have been carried to the part by the blood stream during the process of adhesion formation between the peritoneal surfaces.

3 Of equal weight is the pulse-rate. The average evening pulse-rate in a simple amœbic abscess case, independent of the size of the pus collection, ranges between 90 and 100, the morning pulse being normal. While in a mixed infection, either within the abscess or in a coccus invasion on the surface of the organ, the evening pulse is always above 100 beats, averaging 110, the morning pulse keeping in the neighborhood of eighty-five beats to the minute. So that we can very often judge by the chart record as to the presence or absence of a mixed infection prior to operation.

4 The blood count reveals an increase in leucocytes, principally the polymorphonuclear variety, and in my experience the number is far lower than that usually quoted by authors in writing of this affection. The number varies largely, and no set figures can be given as to certainty. I have operated on four cases in whom the average leucocytosis of each amounted to 11,000. On the other hand, two cases showed a leucocytosis of 44,000, and one of 67,000. These high numbers are rare, however, and the average leucocytosis may be stated as 12,500. This will be true particularly in those cases appearing early for treatment, and in pure amœbic infection. A leucocytosis of even 1000 less is of diagnostic value. The blood count should be made daily at a stated time, for comparison, until the diagnosis has been decided upon.

The presence or absence of malarial parasites in the blood will have no significance in liver abscess, as they are not a causal factor in suppurative disintegration of the organ, and

the hepatitis which they cause is merely of a plastic nature and never goes on to pus formation

5 Distention of the vertical superficial, or subcutaneous veins over the hepatic and epigastric regions, is a sign noted in all cases, even in those in whom the pus collection is very limited. It signifies a process going on within the liver, presumably inflammatory, which interferes with portal circulation, and is marked in greater or lesser degree, according to the extent of liver engorgement. The dilatation of the veins is dependent upon the anastomosis between the portal system and the subcutaneous veins on the lower chest wall and epigastric region, through the veins in the suspensory ligament,—the accessory portal veins of Sappey,—and the veins dilated are the subcutaneous end branches of the superior epigastric and internal mammary. These veins do not become tortuous, but merely become more apparent beneath the skin layer in comparison with those upon the opposite side of the body, and their appearance will act as a guide in a general way to the location of an underlying suppurative zone. For example, prominent subcutaneous veins running upward on the lower chest wall in the anterior axillary or nipple line are associated with abscess in the right lobe near the upper and posterior surface.

6 Absence of jaundice will be taken into account, and in no case of liver abscess will jaundice be noted as a sign. A distinction must be made between the darkened sclera which is always present, and the bile-stained conjunctiva which never exists unless the abscess is complicated by an inflammation and obstruction of the larger bile ducts, as in certain forms of cholelithiasis. I have never seen the two conditions existing simultaneously in the same patient, and in those cases of amoebic abscess of the liver that have come under my observation jaundice was not present, even in a mild degree, in a single case.

7 The absence of splenic enlargement is likewise a noteworthy negative sign. It is a peculiar feature of this disease that, notwithstanding the enormous enlargement of the liver in those cases that come to us late in the course of treatment,

there is no enlargement of the spleen or tenderness over its area. This fact will aid in distinguishing between the disease under consideration and the various anæmiæ and malaria.

8 Friction sounds over the hepatic area are heard in some cases, but they will be present only when the pus accumulation in the liver or its surrounding inflammatory zone has reached the surface of the organ and involved the peritoneal layer, or the process, having gone on to a later stage, and adhesions having formed between the liver and diaphragm, the pleura also becomes involved with a plastic exudate on its diaphragmatic surface. This sign will, of necessity, be present only in those cases well advanced on the course of the disease, or in such cases in which the abscess occurs primarily near the capsule. Friction sounds on the under surface of the liver cannot be detected.

9 Bulging of the right lower chest wall is not apparent in a recent case, or in an old case of medium-sized pus collection. It is noticed only in those cases in which the abscess has reached enormous proportions, and where portal circulation is correspondingly increased. In these advanced cases bulging is noticeable on inspection, and I have seen the circumference of the right lower chest wall increased eight centimetres.

10 Cough, dry in character, is an accompaniment of pleural irritation, and is therefore not complained of by patients in whom the abscess is limited to the parenchyma of the liver. When present, it means that the inflammation has extended through the diaphragm to the pleura at some point. It is therefore an associated symptom with an inflammation that has extended through the capsule. Should the cough be accompanied by a bloody and purulent expectoration, the sputum should be investigated most carefully, and the possibility of abscess rupture into the substance of the lung must be taken into consideration. I have seen three cases in whom the diagnosis was delayed until pulmonary rupture had taken place. In two of these cases the diagnosis of amœbic abscess of the liver was established by the pathologist during the routine

sputum examination on their admission to the hospital with suspected pulmonary tuberculosis

11 Localized œdema of the chest wall, or in the subcutaneous tissues below the rib margin, is never present in recent cases or in large abscesses without adhesions. In cases of long standing, where adhesions have taken place between all the various structures from the liver to the cutaneous surface, œdema in an intercostal space or at a point in the infracostal region is occasionally noticed, and means that pus has invaded all the intervening structures, and is an evidence of delayed diagnosis

12 Basic pneumonia in the right lower lobe is a late complication of hepatic abscess, and is therefore not a condition met with in abscess of recent occurrence or of small size. It is a later stage of the condition which has led up to diaphragmatic adhesions and pleurisy, and will not be found unless the suppurative process has involved all the structures from the liver to the visceral reflection of pleura. It is the result of inflammation extending by contiguity

13 Shortness of breath is also a symptom of the disease far advanced, *i e*, it exists only when the liver is enormously enlarged, or in those cases where adhesions have formed between the liver and diaphragm, or where a visceral pleuritis exists, or where a pus accumulation in the left lobe is encroaching upon the pericardium. In the earlier stages of liver abscess, and in small accumulations in the interior of one of the lobes, normal respiration is not disturbed

14 Pain in the right shoulder, radiating to the side of the neck, gnawing and aching in character, named as a symptom by many writers, is a rare occurrence. It is complained of only by those patients in whom the abscess is located in the neighborhood of the base of the gall-bladder, as in the lobulus spigelii, or in the posterior and inferior border of the right lobe near the transverse fissure. As abscess in this location is not as common as abscesses in other parts of the right lobe, the shoulder symptom will be present in but few cases

15 The skin is moist over the entire body, but I have never seen profuse perspiration in these cases excepting those in whom the abscess had reached large proportions and was on the verge of rupture. Examination of pus from these cases revealed a preponderance of cocci. The skin of the hands is moist like that of the rest of the body, but is rarely cold and clammy.

16 Disturbances of the digestive organs are not severe. The tongue has a characteristic coating of a grayish fur at the base and middle, with clear edges and tip. It is never dry, brown furred, and cracked, as is the tongue of enteric fever. Neither is it thick and indented, as is the tongue of malaria. Very few patients have nausea or vomiting, but anorexia is common, and flatulence is to be expected. The digestive disturbances are limited principally to those conditions dependent upon a previous dysenteric attack, such as constipation and flatulence, or to a concurrent dysentery with repeated evacuations.

17 The urine presents several peculiar features, one of which is that even in small abscesses of the pure amœbic type only, a slight trace of albumen is generally found. If, however, the abscess is a concurrent affection with dysentery, it is not unusual to find a limited number of hyaline and epithelial casts, together with a marked albumen deposit. I do not think, however, that their origin can be traceable to the condition of the liver, for albumen in small quantity, and casts in limited number, are found in nearly every case of dysentery returning from the Islands. The kidney condition more likely depends on the chronic intestinal ulceration, and not on the lesion in the liver.

18 Chills are a rare occurrence, and I have seen but two cases in whom rigors came on during the entire period of their invalidism with this affection. Both these cases had a fulminating streptococcus infection, and were seen late in the course of the disease, the abscesses having ruptured into the pleural cavity. A sense of chilliness is, however, an accompanying symptom in every case.

19 An anæmia of 1,000,000 or 1,500,000 of red blood-corpuscles is the rule, with 60 to 80 per cent of hæmoglobin.

20 Pain or discomfort in swallowing is a symptom associated with pus collections in the left lobe,—a pressure symptom sometimes seen in multiple abscesses where the left lobe is greatly enlarged

21 Stupor and delirium are absent except in fatal cases, as in the last stages of multiple abscess

Stool examination, positive for amoeba, is merely confirmatory. The absence of amoeba in the faeces has no significance

I may state here that the X-rays are of no benefit as a diagnostic means in small abscess in the interior of the organ, as they are obstructed in almost equal measure by the density of the liver substance and the pus collection, and the difference in the shadows cast is indefinable. Where the abscess has reached large proportions or encroaches on the capsule, the change in surface contour can sometimes be outlined with the fluoroscope, and this evidence will supplement the information given by percussion

To recapitulate the features which characterize a typical liver abscess case seen early in the course of the disease. He gives a history of dysentery contracted in the tropics, and has lost weight, his features are drawn, his complexion is ashy-brown, he suffers with languor, and complains of a dragging pain in his liver, his liver dulness is increased on percussion and has an area of tenderness, his temperature rises in the evening to 100° F (pure amoebic type) or to 102° F (mixed infection), the corresponding morning temperature being 98° F and 99° F, his evening pulse is 95 (pure amoebic type) or 110 (mixed infection), the corresponding morning beats numbering 72 and 85. He has a leucocytosis of 12,500, 70 per cent hæmoglobin, and 3,500,000 red blood cells by count, the subcutaneous veins over the hepatic area are dilated, he has no jaundice or splenic enlargement, there are no friction sounds over the hepatic area, nor is there bulging of the chest wall, or local oedema, cough is not a symptom, basic pneumonia is not present, and there is no dyspnoea, the skin is moist, the tongue is coated with a grayish fur, and he is either constipated

(postdysenteric) or has an active chronic dysentery, his urine shows a trace of albumen, and at times casts, he feels chilly but has no rigors, his brain is clear but inactive, he is generally an ambulatory case, but feels very much out of sorts, and is willing to resort to anything to be restored to health

THE TREATMENT OF POSTERIOR PERFORATIONS OF THE FIXED PORTIONS OF THE DUODENUM¹

BY JOHN EDWARD SUMMERS, JR., M.D.,

OF OMAHA, NEBRASKA,

Surgeon to Clarkson, Douglas County and Wise Memorial Hospitals

RETROPERITONEAL perforations of the duodenum are of such infrequent occurrence that little attention has been directed towards their treatment. In fact, after as careful a study as my facilities afford, I have been unable to find anything written upon the subject which is at all satisfactory. During the past year Theodore Kocher has published in the *Zentralblatt für Chirurgie*, No. 2, a paper entitled "Mobilisierung des Duodenum und Gastroduodenostomie," in which he explains very fully from an anatomical and clinical standpoint how it is possible and even easy (in the absence of chronic inflammatory conditions involving the head of the pancreas, gall-ducts, stomach, and perhaps the neighboring under surface of the liver) to so free the descending as well as the lower flexure of the duodenum that, by rotating these mobilized parts towards the left, a gastroduodenostomy can be done with great ease,—the duodenum and stomach being lifted through the abdominal incision for the more proper carrying out of the technique.

Kocher was preceded in this operation, *ie*, "gastroduodenostomy," by Villard, Jaboulay, and Henle, but it does not appear from their writings that these surgeons fully comprehended the amount of mobility the duodenum was susceptible of *after* certain preparatory procedures. In passing, it may be noted that the intestinal end of the common bile duct has been exposed and attacked after the same preliminary freeing of the duodenum. Although it is not in my province

¹ Read before the Western Surgical and Gynæcological Association, December 28, 1903

at this time to discuss the advantages pro and con of gastroduodenostomy over other surgical methods, neither does the surgery of the gall-tracts fall within the scope of my paper

I have called attention to both in order that I may emphasize a method which is anatomically and clinically applicable in the treatment of retroperitoneal perforations of the duodenum. The parts involved must be susceptible of exposure and rotation forward into the light of an abdominal incision.

Jeannel (Mikulicz, Kausch, *Handbuch der praktischen Chirurgie*, Band III, 1903) has recently collected out of the literature thirty-five cases of injury to the duodenum. Among the subcutaneous perforating injuries he calls attention to the comparative frequency of complete tearing off of the duodenum, there were five cases,—three close behind the pylorus and two at the junction of the duodenum and jejunum. This is explained by the fact that at these two points a freely movable part of the bowel joins a fixed portion. The incomplete ruptures are found at the lower half of the duodenum. Among twenty cases of incomplete rupture, the superior part was involved two times, at the level of the papilla of Vater, four times, below this, but still in the descending part, three times, in the inferior portion seven times. The site of the lesion was found fourteen times through the anterior peritoneal bedecked surface and only six times through the posterior wall. In all of these cases, except one, the direction of the rupture was at right angles with the long axis of the bowel. The length of the tears varied from the very smallest to those involving two-thirds of the circumference. In looking up the subject of gunshot wounds of the duodenum I ran across only one case, reported by Douglas in his recent book upon "Abdominal Surgery," this wound involved the first part of the duodenum and was operated upon successfully.

According to Mikulicz (*Praktischen Chirurgie*, Band III, 1903), no case of posterior perforation of the fixed portions of the duodenum has been operated upon. Cachovié (*Centralblatt für Chirurgie*, No. 25, 1903) refers to a paper written by himself, "Ueber Fistulen des Duodenum," *Archiv für klin*

Chirurgie, Band lxi, Heft 3, in which he discussed the methods of treating these fistulæ by duodenorrhaphy, gastro-enterostomy, and jejunostomy, especially calling attention to the necessity of closing the pylorus when a gastro-enterostomy is done in order to prevent the stomach contents passing into the duodenum, and in this way preventing a closure of the fistula. Cachovié reports a case operated on in July, 1902, in which, to control a circulus vitiosus, he closed the pylorus by a seromuscularis "tobacco-pouch" stitch, and likewise shut off, by the same stitch, that part of the jejunum between the gastro-enterostomy opening and that of an entero-anastomosis done four and one-half months previously. On post-mortem one and one-half months later it was found that the latter occlusion was complete, the former nearly so.

Should a contusion of the abdomen be followed by signs leading one to suspect a rupture of the duodenum, and in consequence an abdominal section be determined upon, or should a stab wound from behind or a gunshot wound from either in front or behind disclose upon section that the posterior fixed duodenum was opened, several things are to be considered in an attempt to repair the injury. First, the relations of the peritoneum in this locality, second, the size and direction of the blood-vessels. Huntington ("Anatomy of the Peritoneum and Abdomen") has shown very beautifully that in the development of the intestines and peritoneum how by rotation from left to right the duodenum becomes fixed, and only covered in front by peritoneum. The early peritoneal investment after rotation blending to the right with the parietal peritoneum, the mesoduodenal investment blending behind with the primitive parietal peritoneum.

By cutting perpendicularly through the peritoneum about three centimetres to the right of the descending portion of the duodenum and insinuating the finger behind towards the left, it is quite easy to reverse the original rotation. The descending portion of the duodenum and its lower flexure can be lifted out of the bed of loose cellular tissue formed by the fusion of the right mesoduodenum and the primitive

parietal peritoneum This movement exposes the posterior surface of the duodenum and admits of its repair Kocher (*Centralblatt für Chirurgie*, No 2, 1903), "The relations of the blood-vessels determine the limit of the rotation and lifting forward of the bowel The concave left-sided commencement of the duodenum is supplied with blood by the gastro-epiploica dextra, the chief branch of the gastroduodenalis Important branches also go to the transverse colon over the inferior portion of the duodenum These vessels lie under the upper layer of the gastrocolic ligament, and offer in themselves little hindrance to the lifting up of the inferior part of the duodenum from the spinal column

"If the colon is raised, we see the colica dextra, the large branch of the superior mesenteric The artery runs horizontally from left to right, and the branches pass down the duodenum to the lower and lateral circumference, and also to the right flexure of the colon These vessels are not so easily lifted towards the left as those of the gastro-epiploica dextra, but nevertheless they do not prohibit the freeing of the inferior flexure of the duodenum to the extent but that the whole vertical portion or limb may be loosened and brought forward The rotation is made with the hepatico-duodenal ligament above as a fixed point and a continuation downward of the left border of the duodenum over the head of the pancreas as an axis The lower fixed point is determined by the location of the branches of the colica dextra which limit the rotation and lifting up of the inferior flexure and a portion of the lower duodenum "

My own work upon the cadaver convinces me that Kocher is right when he states that by this procedure no damage to blood-vessels is done, as the peritoneum is separated from in front of the right kidney, and between this and the beginning of the transverse colon and the loose cellular tissue in front of the vena cava and aorta

One year ago I reported a case of hæmatoma which pressed from behind upon the descending duodenum and its lower angle It caused complete obstruction of the bowel

The tumor resulted from a contusion of the anterior abdominal wall, and could be palpated. Upon opening the abdomen, the peritoneum on the right side, *i e*, the primitive fused mesoduodenum and parietal peritoneum, appeared like a mesentery.

This was incised to evacuate a sufficient bulk of the clot to relieve the obstruction of the bowel. The exploring fingers could be passed freely behind the vertical portion of the duodenum.

Recently, a case of gunshot wound involving the anterior wall of the upper vertical portion of the duodenum and the posterior wall of the duodenum nearer the lower angle came under my care.

A young man, in attempting to escape from a policeman, was shot in the back by a 38-caliber Colt's revolver, the ball entering just below the twelfth rib and through the outer edge of the erector spinæ muscles, coming out in front one and one-half inches below the juncture of the ninth right costal cartilage and the right rectus muscle. One hour after the shooting the patient was etherized under customary hospital surroundings. The abdomen was opened by a vertical incision through the wound of exit. It was observed that the bullet had, in its course from behind forward, perforated the duodenum and gall-bladder. The wound in the anterior duodenal wall was sutured, likewise both holes in the gall-bladder.

Because of the bad condition of the patient, it was decided not to attempt to expose the posterior duodenal wall from in front, but rather to rely temporarily upon an incision from behind and the introduction of a gauze pack. In the carrying out of this latter procedure, I discovered, as expected, that the bullet had made a groove through the lower pole of the right kidney,—another reason for the posterior incision. A liberal gauze pack drain was introduced down to the repaired duodenal wound of exit and the wounds of the gall-bladder, and the abdomen closed so as to admit of drainage.

The patient died three days later, the post-mortem illustrating the cause of death to be a retroperitoneal phlegmonous

inflammation without peritonitis. Had the man's condition admitted, I would have sutured the wound in the posterior duodenal wall after freeing and rotating the duodenum to the left. In the light of to-day, one should in a like case, in addition to repairing the duodenal wound or wounds, occlude the pylorus by means of a purse-string stitch. Either at this same operation or as soon thereafter as reaction admitted, a gastro-enterostomy must be made. None of the procedures which I have indicated require much time or handling of the intra-abdominal contents, they are the only rational methods of treating a perforation of the posterior wall of the duodenum. It is almost impossible for a gunshot wound of either the stomach or duodenum, which perforates both walls, to be limited to those organs, therefore, under such circumstances, in addition to the repair of any intraperitoneal organs involved, proper incisions must be made to provide for the retroperitoneal damage. Wiart and Mikulicz recommend a somewhat similar line of procedure, although they have had no experience in the practice.

INTESTINAL OBSTRUCTION DUE TO FIBROUS STRICTURE CONSEQUENT UPON STRANGULATED HERNIA

WITH AN ACCOUNT OF THREE NEW CASES

BY PERCY W G SARGENT, M B , B C (CANTAB),
F R C S (ENG),

OF LONDON,

Resident Assistant Surgeon, Late Surgical Registrar to St Thomas's Hospital

WHEN the immediate dangers attendant upon strangulated hernia have been safely passed, it is rare for any trouble directly consequent upon the strangulation to arise at a late period. In a recent paper Bloodgood¹ has called attention to this fact, and quotes a large series of operations for all classes of hernia at the Johns Hopkins Hospital, numbering over 900, in which there was but one case of obstruction occurring in a patient who had recovered from the first operation. This case proved fatal, but no details are given. Considering the large number of recoveries from strangulated hernia, either after operation or after successful taxis, and the amount of damage which in many cases must have been sustained by the bowel during its incarceration, it is remarkable how few of the patients suffer at a later period from intestinal obstruction due to cicatrization.

Treves,² writing in 1899, stated that he had found, besides some specimens in museums, only eleven recorded cases of this condition. Most of these, together with some others, will be found tabulated at the end of this paper, in addition to three new cases which have come under my own observation. Two of these were in St Thomas's Hospital, under the care of Mr Clutton and Mr Battle respectively, for whom I acted, and who have kindly allowed me to make use of them. The third was a private patient of Mr F C Abbott, whom I assisted at the operation, and who has kindly placed his notes at my disposal.

The explanation of the rarity of this condition is, I think, to be found in the fact that the trouble is only likely to occur in

an uncommon class of hernia, namely, where the damage has been too great to allow of perfect recovery, and yet not sufficient to produce complete gangrene. When gangrene of the whole thickness of the gut wall is found to have occurred, or is considered likely to happen, it is treated either by invagination, resection, or enterostomy, or else, having been returned into the abdomen, it brings about a fatal issue from peritonitis.

Stricture after strangulated hernia may therefore be regarded as a sequela of those "doubtful" cases which are fortunate enough to escape perforation after reduction.

Although the condition of the gut is by no means dependent upon the duration of strangulation, it is of some interest to observe that in those cases in which it has been noted the time has varied from fourteen to seventy-two hours, the average being fifty-five.

In the series under consideration, whilst there has usually been some additional factor in the production of the obstruction, such as adhesions or kinking, there has in all been a structural change in the bowel wall primarily, and I have excluded cases where the adhesion, kink, or other accident was the sole cause.

Pathology —In most cases the stricture has been single and extensive, in the minority there have been two annular constrictions at a short distance apart, with a pouch of non-cicatrizied gut between them. We may therefore distinguish two kinds, each having a distinct mode of production.

(1) The single stricture. From experiments on animals, carried out by placing clamps at varying pressures upon the mesentery, Maas³ found that when only the venous circulation in a portion of the bowel is interfered with, the resulting congestion passes off after removal of the clamp, and leaves no structural change. If, on the other hand, the arterial supply also is interfered with, then one of two events follows, (a) if only for a short period, necrosis of the inner coats occurs, commencing in the mucous membrane, and commensurate in depth with the duration of the ischæmia, (b) beyond a certain period of time total gangrene results.

The single stricture, whether involving the whole circumference of the bowel or not, follows upon necrosis due to temporary interference with the arterial supply of the loop. In Bryant's⁴ case, for example, the cicatricial area was an inch and a half long, "as though the whole loop had suffered." This might easily result from the strangulation of a small knuckle, such as is so often found in a femoral hernia. Belonging to this class are the cases of Mollard,⁵ Maas,³ Newton Pitt,⁷ Goodhart,⁸ Obre,⁹ and Nicaise¹⁰

(2) The double stricture. This is produced in an entirely different manner, being dependent upon cicatrization resulting from direct local damage at the site of strangulation. In the cases which I have had the opportunity of examining, it was obvious that the mucous membrane, as well as the other coats, had suffered. In all the peritoneum looked white and thickened at the site of the cicatricial ring. But it is of interest to note here a case recorded by Allaux,¹¹ in 1860, in which the mucous membrane was normal and moved freely over the stricture which involved only the outer coats. In this instance there are no clinical details, as the patient when first seen was moribund from peritonitis, and died almost immediately. At the autopsy a portion of bowel was found, a little distance above the ileocæcal valve, which had been involved in a femoral hernia. There were four annular constrictions, a few centimetres apart, with dilated pouches between them. No history of previous strangulation was given, and Allaux attributed these rings to the pressure of an ill-fitting truss.

The annular stricture is the less common variety, and for this reason, that damage sufficient to produce any considerable degree of cicatrization would rarely be arrested at this point, but would either lead to extensive necrosis with subsequent perforation, or would guide the surgeon to anticipate such a calamity by resection or some other means.

The instances of this variety of stricture are those of Alexis Thomson,¹² Raoult,¹³ Bernard Pitts,¹⁴ and the three which are here given in detail. I have classed Abbott's case under this heading, although only one stricture was found. It was annu-

lar, narrow in vertical extent, and had evidently been produced in the same manner as the others

No doubt the two varieties are sometimes present together, for in the cases of Gallé and Maas well-marked constriction grooves were noted at the herniotomy. In many cases where such lines of constriction have been observed, the resulting cicatrization must be too slight to be a subsequent source of danger unless some additional factor be added.

Whether the stricture is of the first or the second variety, obstruction may be brought about in any of the following ways

- 1 The actual lumen may become progressively narrowed so as to cause symptoms of varying severity

- 2 Indigestible substances may become impacted above the stricture. In one instance a mass of beans and raisin seeds was found,¹⁰ in another, a number of orange pips and currants

- 3 Adhesions to the parietes or to neighboring viscera (the bladder in one case³) will add to the dangers of obstruction

- 4 Adhesion between the gut above and below the stricture, and the formation of a spur. In the case recorded by Nicaise this had occurred in such a manner as to mimic the ileocolic junction. The dilated pouch above resembled the cæcum, and the strictured part projecting into its lumen, the ileocæcal valve

- 5 A sudden kink at the site of constriction may occur independently of adhesions

Variety of Hernia and Portion of Bowel involved—Both inguinal and femoral strangulations have preceded the obstruction, the inguinal rather more commonly than the femoral, but I have been unable to find an instance following any other variety. Goodhart's case, in which the structured gut was found, post-mortem, occupying an obturator hernia, was the result of a femoral strangulation five years previously

As regards the portion of bowel involved, all the instances have occurred in the small intestine, no example of stricture of the colon from this cause having, so far as I am aware, been recorded. This fact goes hand in hand with the preceding, since the colon is comparatively rarely strangulated, and then it

is most frequently found in an umbilical or a ventral rupture. Most of the instances have occurred in the ileum, but some in the jejunum. In one example it was only two feet below the duodenum,¹² in another six, and in a third nine.¹⁰

Course of the Symptoms—Any interval may elapse between the strangulation and the commencement of the resulting obstructive symptoms. It has varied from a week up to eighteen years. In the majority of instances the symptoms have either been of a chronic nature throughout or chronic terminating acutely. These have been marked by spurious diarrhoea, frequent vomiting, abdominal distention, and progressive emaciation. In very few has a sudden acute obstruction occurred without previous symptoms. Such cases would most probably be due to a sudden acute kink at the site of constriction, a condition which was actually present in one of my cases. One or two have been marked by excessive diarrhoea shortly after the herniotomy, pointing to ulceration of the mucous membrane.

Treatment—This must of course depend upon the condition found at the operation. Undoubtedly the ideal treatment is to widen the lumen by dividing the stricture in the long axis of the bowel and suturing the resulting wound in the transverse diameter, but the cases in which this would be possible are rare. On the analogy of pyloroplasty, the name enteroplasty has been applied to this operation although the conditions are not precisely similar. The successful cases of Mollard and of Abbott were dealt with in this manner, and Allingham¹⁵ has given two successful cases in which the operation was done for simple stricture of the intestine due to other causes. It is well, however, to bear in mind the possibility of a kink occurring at the mesenteric border after the suturing is completed, and the consequent formation of a spur at that spot.

Where two strictures occur at a distance from one another or where the stenosis is too extensive, or too complicated by adhesions for enteroplasty to be done then lateral anastomosis would be the best treatment. In one case, indeed it looked as though nature had indicated this line of treatment, for adhesions

had occurred, followed by ulceration, between the bowel above and below the obstruction, thus producing what one might almost look upon as a natural lateral anastomosis. In cases of acute obstruction, however, the conditions of vitality of the gut wall and the virulence of its contents would militate against success in this as in other forms of acute intestinal obstruction. In my first case death was due to purulent peritonitis, although the lateral anastomosis had not leaked. I attribute this to the virulence of the intestinal contents, and believe that the right way to have dealt with the case would have been to relieve the obstruction by enterostomy, and to have done the anastomosis after the bowel had resumed its normal condition. Alexis Thomson suggests lateral anastomosis, but prefers resection. Both his cases treated in this manner recovered, as also did those related by Garié and Maas. Considering the innocent nature of the stricture, however, this would appear to be an unnecessarily severe procedure, especially if extensive adhesions are present, unless called for by perforation, actual (as occurred in two cases) or threatened.

CASE I—A male, aged forty-eight years, was admitted to St Thomas's Hospital on March 30, 1903, under the care of Mr Battle, suffering from acute intestinal obstruction of three days' duration. There was a short scar over the right iliac fossa, the site of what, from the history, had been an appendicular abscess opened thirty years previously. He gave a history of having had a strangulated hernia reduced under chloroform eighteen years before. He did not remember how long the symptoms had lasted before the reduction. There was a partially reducible left inguinal hernia, quite slack, and having an impulse on coughing. It was thought that the obstruction might be due to adhesions consequent upon the abscess thirty years previously. The abdomen was opened in the mid-line below the umbilicus. Distended small intestine presented. On following this downward the cause of the obstruction was found situated in the ileum about three feet above the ileocaecal valve. There were two annular fibrous constrictions two inches apart, the portion of bowel between them being dilated to form a pouch. There were no adhesions involving

this portion of the intestine Both constrictions were pervious, but the lumen was occluded by an acute kink at the site of one of them A lateral anastomosis was effected between the portions of intestine above and below the obstruction On the third day the bowels were opened Unfortunately, death occurred from peritonitis on the fourth day At the autopsy the anastomosis was found to be water-tight, so that the peritonitis must have been due to operation infection The left inguinal canal was occupied by a process of omentum There were many old tough adhesions in the right iliac fossa and between the liver and parietes

CASE II—A female, aged forty-one years, was admitted to St Thomas's Hospital, under the care of Mr Clutton, on October 30, 1903, with symptoms of acute intestinal obstruction of two days' duration There were signs of free fluid in the peritoneal cavity, and the liver dulness was absent in front Five months previously she had been operated upon for a left femoral hernia which had been strangulated for thirty-six hours In the light of the previous case, it seemed probable that obstruction and perforation had occurred at the site of the previous strangulation, and this turned out to be the case The abdomen was opened through the left rectus Feculent fluid and gas escaped Adherent to the neighborhood of the left femoral ring was a coil of small intestine which had perforated The patient's condition was so bad that nothing radical could be attempted The offending coil was therefore brought outside the abdomen, the peritoneum cleansed as thoroughly as possible, and the wound partially closed Death took place a few hours later For the pathological description I am indebted to Dr C R Box, who performed the autopsy

"Six feet below the duodenojejunal flexure was a perforated coil of small intestine The gut in this situation was doubly strictured as if it had been nipped in a hernia Above the upper stricture there was a pouch, and in the pouch was an extensive ulcer Below the stricture was another pouch and then the second stricture Lodged in the pouches were some orange pips and currant skins The kinked bowel had become adherent to itself in such a manner that the part above the upper stricture was adherent to the part immediately below the lower one, and a fistulous communication had been thus established from the ulcer to the gut below the lower constriction The adhesions tunnelled

by the fistula had perforated, and in addition the ulcer had perforated on the opposite wall of the bowel. The ulcer was chronic, and the gut above the obstruction was dilated and thickened. The normal lumen, though present, was very tortuous at the obstructed part."

CASE III—Mr Abbott's Case—The patient was a gentleman aged seventy years, who had led an active and healthy life. He had suffered from a left inguinal hernia for twenty years, which had given him trouble from time to time, and for which he had always worn a truss. Three months before operation he had over-exerted himself by carrying a portmanteau, and on the next evening was seized with colicky pain, which rapidly became worse. The abdomen was hard and tender, especially in the left lower part. He became cold and collapsed and vomited. The pain was relieved by morphia and fomentations, but the vomiting continued, ultimately becoming black. On the second evening after the attack he passed a stool containing much dark blood, and in a few days he recovered completely. He did not recall the condition of the hernia at the time, but this attack was in all probability due to the strangulation of a piece of bowel which luckily freed itself. During the following three months he had four severe attacks of abdominal pain, with constipation and vomiting, and for the whole of that period he had suffered from troublesome and unaccustomed constipation. On examination, there was a moderate-sized, easily reducible left inguinal hernia. The abdomen appeared absolutely normal.

Operation—The abdomen was opened through the left rectus. A ring stricture was found in the ileum two and a half feet above the ileocaecal valve. At this point the bowel was markedly contracted, the peritoneum was dull white and thickened, and the wall of the gut felt thickened. On opening the bowel by a longitudinal incision above the stricture there was seen to be a tight fibrous ring having a lumen the size of a cedar pencil. No trace of a second stricture could be found. The incision was then carried downward through the stricture, and the wound was sutured in a transverse direction. There seemed to be a slight kink at the mesenteric border, but the lumen was perfectly free. The abdominal wound was closed in layers. There was a severe and prolonged attack of colic on the second day, accompanied by visible peristalsis, which was believed to be due to obstruction caused by

the kink and swelling at the line of suture. The attack was relieved by morphia and a turpentine enema, and there was no further trouble of any kind. Mr Abbott writes "I believe that the first attack was due to the strangulation of the hernia, and that the subsequent ones were caused by the commencement and increase of the stricture. Owing to the small transverse length of the fibrous ring when opened out, a kink was produced at the mesenteric side when the enteroplasty was completed. For this reason I believe that an anastomosis would have been the better operation, and is the course I should adopt in a similar case."

BIBLIOGRAPHY

- ¹ ANNALS OF SURGERY, December, 1903, p 806
- Intestinal Obstruction, Second Edition, 1899
- ² Deut med Wochenschr, 1895, p 365
- ³ Medical Times and Gazette, 1872, p 467
- ⁴ Lyon Med, 1899, Vol xc, p 467
- ⁵ Beitrage zur klinischen Chirurgie, 1892, Band 18, p 187
- ⁶ Transactions of the Pathological Society, London, Vol xlii, p 119
- ⁷ Transactions of the Pathological Society, London, Vol xxvii, p 161
- ⁸ Transactions of the Pathological Society, London, Vol iii, p 95
- ⁹ Revue de Chir, Paris, 1881
- ¹⁰ Thèse de Paris, 1860
- ¹¹ Transactions of the Medico-Chirurgical Society, Edinburgh, Vol 18, p 110
- ¹² Bull Soc Anat de Paris, Vol lxxvi
- ¹³ St Thomas's Hospital Reports, 1896
- ¹⁴ Lancet, 1894, Vol 1, p 1551
- ¹⁵ Quoted by Thomson
- ¹⁶ Quoted by N Pitt
- ¹⁷ St Thomas's Hospital Reports, 1890

TABLE OF RECORDED CASES

No	Author	Sex	Age	Kind of Hernia	Duration of Strangulation	Interval	Portion of Bowel involved	Pathological Condition found	Character of Symptoms	Treatment	Result
1	Bryant ⁴	F	52	Femoral	30 hours	7 weeks	Ileum	Single stricture	Chronic	No operation	D
2	N Pitt ⁷	F		Femoral		5 days	4 feet from cecum	Single stricture, perforation	Chronic	No operation	D
3	Obre ⁹	F	34	Direct inguinal	3 days	7 months	1 foot from cecum	Single stricture, adhesions	Chronic	No operation	D
4	Garré ⁶	M	27	Inguinal	14 hours	5 weeks	Ileum	Single stricture, adhesions	Chronic	Resection and axyl anastomosis	C
5	Mars ³	F	47	Inguinal	24 hours	16 days	Ileum	Single stricture, adhesions	Subacute	Resection and anastomosis	C
6	Thomson ¹	M	31	Inguinal	3 days	3 weeks	Ileum	Double stricture	Chronic	Resection and axyl anastomosis	C
7	Thomson ¹⁰	M	2	Inguinal		5 months	2 feet below duodenum	Double stricture	Acute	Enterostomy, Subsequent resection and anastomosis	C
8	Card ¹⁰										
9	Raoul ¹³	M	54	Femoral		7 months	3 feet from cecum	Double stricture	Acute	No operation	D
10	Mollard and Bernays ⁵	F	44	Femoral	80 hours	6 months	Ileum	Single stricture, adhesions	Acute	Enteroplasty	C
11	Nicase ¹⁰	M	45	Inguinal		5 years	9 feet below duodenum	Single stricture, kinking	Chronic	Enterostomy	D
12	Fagge ¹⁷					2 months	2 feet from cecum	Single stricture	Chronic	No operation	D
13	Goodhart ⁸					5 years		Single stricture, kinking	Chronic	No operation	D
14	S Jones ¹⁸	F	49	Inguinal	4 days	3 weeks	Ileum	Single stricture, kink	Subacute	Enterostomy	D
15	B Pitt ¹⁴	F	27			3 years	Ileum	Double annular stricture	Chronic	Lateral anastomosis	C
16	Abbott	M	70	Inguinal		3 months	2½ feet from cecum	Single annular stricture	Recurrent subacute attacks	Enteroplasty	C
17	Sargent	M	48	Inguinal		18 years	3 feet from cecum	Double annular stricture with kink	Acute	Lateral anastomosis	D
18	Sargent	F	41	Femoral	36 hours	5 months	6 feet below duodenum	Double stricture with kink, perforation	Acute	Enterostomy	D

PAPILLOMA OF THE RENAL PELVIS WITH MASSIVE HYDRONEPHROSIS

BY HARRY B REYNOLDS, M D,
OF SAN FRANCISCO

THE report of the present case is justified by the size of the hydronephrosis and the rarity of papillomata of the renal pelvis

The patient presented himself to the out-patient service of the San Francisco Polyclinic complaining of massive enlargement of the abdomen. He was referred to our wards at the city and county hospital, where the following history was taken

H C, male, aged sixty-six years, widower, born in Ireland, laborer

Family history, negative. Previous history, negative, denies syphilis, and there is no subjective evidence of the disease. Had a bubo and chancroids forty years ago. Moderate drinker.

Present illness. About a year ago he first noticed distress after eating, with eructations of gas. Soon thereafter he began to have frequent urination, which was rather spasmodic than constant. Often he would urinate several times in a night, and at times would fill a chamber vessel before morning. At other times urination was of normal frequency. About nine months ago he first observed an increase in the size of his abdomen. It gradually but constantly enlarged until it attained its present proportions. Since the appearance of the tumor he has on several occasions passed dark-colored urine. These attacks lasted hours or days and were not accompanied by other urinary signs. For months he has been gradually losing flesh. He is considerably lighter, and thinks the presence of the tumor accounts for the fact that he has not lost more weight. His strength has diminished, but not excessively. Appetite good. Bowels constipated. At no time has he suffered pain.

Physical examination, December 1, 1903. Man of medium frame, poorly nourished. Appearance of a man thin by nature.

Not cachectic, but somewhat resembling a patient with a large ovarian tumor. Skin greasy and pale. Mucous membranes pale. Tongue coated with a brownish-yellow layer. Lungs hyperresonant. Heart apex in fourth interspace in mid-clavicular line. Sounds clear but not forcible. Pulse 80, slight tension, regular in rhythm. Some sclerosis.

Abdomen Distended to the extent of an abdomen pregnant at term (Figs 1 and 2). Wall thin and tense. Umbilicus protuberant. Left side seems fuller than the right. Palpation shows a large, tense, rounded mass filling the whole abdomen, extending upward beneath the left costal border and into the left flank and passing downward below the pelvic brim and well over into the right side of the belly. It is tense, smooth, movable, apparently thin walled, and transmits a fluid wave with great delicacy. Just above the symphysis there is a small, oval irregularity like an attached loop of bowel or mass of omentum. Percussion gives dulness extending down from the left costal border continuous with the liver dulness, reaching without interruption to the back, well down to the left ligament of Poupart, and a variable distance to the right of the median line. Tympany in the right flank in all positions. Across the summit of the cyst is a ridge or band coursing over from the right and above the umbilicus, thence across and downward about eight centimetres from the navel outward towards the left ilium, thence down into the pelvis. It gave the feel and peristaltic wave of gut, and on inflation proved to be the colon. Greatest circumference of abdomen ninety-nine centimetres.

Extremities thin and flabby, glands in both axillæ, multiple, small nodules without periadenitis, and all of about the same size. Scrotum long and pendulous. Moderate double varicocele. A small, hard, movable mass is to be noted in the left cord.

Urine The quantity of daily urine at no time showed any variation from the normal. After the first examination of the abdomen, with the accompanying manipulation of the tumor, blood was passed for about thirty-six hours, but then cleared up. Some days later bloody urine was again passed, the amount being decided. After the first hæmaturia had ceased, a specimen examined was pale yellow, clear, 1020, no albumen, no sugar, no casts. The bloody urine showed no fresh red cells, but degenerated reds and leucocytes.

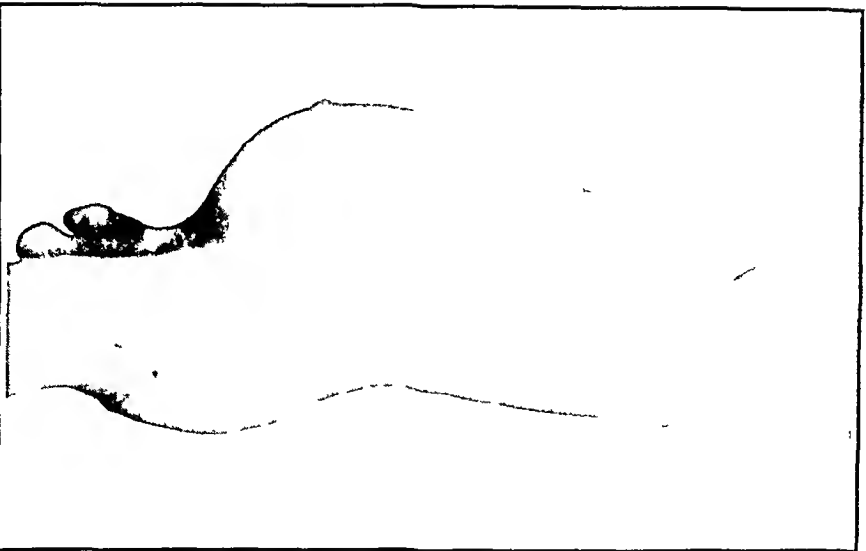


FIG 1 —Showing abdominal protrusion caused by hydronephrosis

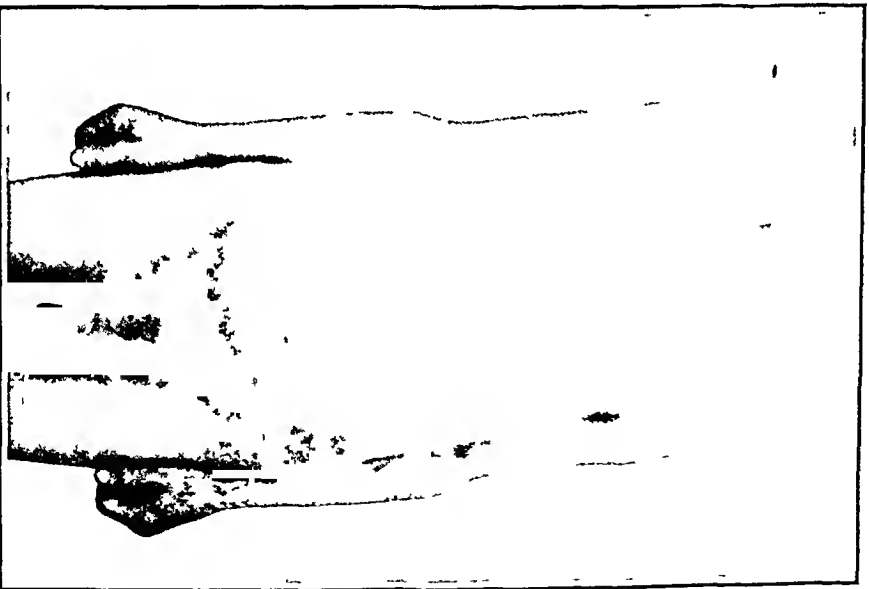


FIG 2 —Anterior aspect of abdomen distended by hydronephrotic sac

Blood examination, December 3, 1903 Red cells, 4,300,000, white cells, 13,000, hæmoglobin, 55 per cent, polymorphonuclears, 83 per cent, large lymphocytes, 10 per cent, small lymphocytes, 7 per cent

A second examination three weeks later gave, Red cells, 4,200,000, white cells, 6000, hæmoglobin, 41 per cent Cystoscopy was ineffectual because of hæmorrhage from the bladder, probably due to varicosities at the vesical neck

Urinary segregation by the improved Cathelin instrument was not practicable because of the pressure of the tumor, which prevented normal distention of the bladder

The cyst was tapped in the left flank by the exploring needle The needle entered a single large cavity The fluid withdrawn was a dark, reddish-black, opaque fluid flowing easily through the needle A sediment soon settled consisting of broken-down red and white blood-cells No tumor cells were found Traces of urea were detected The dark fluid above the sediment contained albumen and paralbumin

In considering the diagnosis, pancreatic cyst, mesenteric cyst, suprarenal tumor, and perinephric cyst were considered, but excluded The position of the mass, dulness in the flanks, position of the colon, all indicated a retroperitoneal cyst The urinary findings pointed strongly to the kidney The size, presence of blood in the urine, periodic polyuria, and presence of urea in the aspirated fluid pointed strongly to hydronephroma The cause of obstruction was obscure Stone was eliminated by the absence of pain The prostate was not enlarged, and there was no palpable tumor on rectal examination Thus the possibilities were considered to be (1) papilloma of renal pelvis obstructing the ureter, and (2) malignant tumor causing pressure on the ureter and bleeding into the resulting hydronephrotic sac Of these tumors, sarcoma was least probable because of the age There was little ground for choosing between hypernephroma and carcinoma, but the greater frequency of the latter (30 per cent of all kidney tumors of adults as against 17 per cent of hypernephromas) as well as the age of the patient cast the probabilities on the side of carcinoma A closer diagnosis was considered unwarrantable, and the patient came to operation with a tentative diagnosis of (1) papilloma of renal pelvis or (2) carcinoma or hypernephroma of the kidney

Operation, January 10, 1904, chloroform. An incision fifteen centimetres long was made two centimetres above ilium in such a direction as to be easily enlarged into the usual oblique nephrectomy wound. The cyst was punctured and fourteen pints of dark syrupy fluid removed. The cyst being collapsed and palpation showing no evident malignant mass or glandular enlargement, I decided on radical operation. The wound was therefore enlarged and the cyst removed. The wall was firmly adherent throughout and separation was tedious and progressed inch by inch. The outer layer of mesocolon, the large gut itself, and then the vascular mesocolon layer were in turn separated. The pedicle was ligated in mass. The ureter found, ligated, cut, and cauterized. No kidney tissue could be found. The peritoneal cavity was opened once by accident, but the rent was immediately closed. Hæmorrhage was slight and easily controlled. A Mikulicz tampon was inserted into the cavity and the ends of the wound closed around the gauze. The operation lasted two hours and twenty minutes. He was returned to the ward in fair condition, pulse of 100, soft and compressible. The patient passed sixteen ounces of urine the first twenty-four hours. For two days he continued to do unexpectedly well. Temperature, 100° – 101° F pulse about 100. No pain, mind clear, considerable serous oozing but no hæmorrhage from the wound. On the third day, however, he began to develop a hypostatic congestion, which was obstinate to energetic treatment, and resulted in death on the fifth day. The pneumonia was not infectious, but purely hypostatic and due to the weakened circulation, the direct result of a severe operation in a patient nearly seventy years old, of low vitality, and with marked hydræmic blood (hæmoglobin, 42 per cent.)

Autopsy showed the other kidney normal, the wound and cavity in good condition, no metastatic glands, and marked hypostatic pneumonia.

The cyst was a large hydronephrotic sac with no tissue showing kidney structure. The tumor found was a papilloma the size of a small tomato situated just above the ureteric orifice and blocking its entrance by tumor masses. The microscope verified the diagnosis.

Tumors of this description are exceedingly rare. Albarran and Imbert, in their exhaustive study of renal tumors pub-

lished in 1903, have been able to collect but twenty-two cases, though their researches and reviews are exhaustive and extend over a period of years. The histories are typical,—progressive hydronephrosis, occasional bloody urine and polyuria, entire and characteristic absence of pain except for occasional mild colic from the passage of clots or tumor bits through the ureter.

Treatment is nephrectomy. Indicated by the progressive anæmia caused by the bleeding, liability to malignancy, and impossibility of diagnosing from malignant tumors.

THE RONTGEN-RAY DIAGNOSIS OF RENAL CALCULUS

BY JOSEPH F SMITH, M D ,

OF CHICAGO,

Assistant Surgeon to the Presbyterian Hospital

THE development of the Rontgen technique marks the introduction of an exact method in the diagnosis of renal calculus. Formerly the diagnosis was made from the symptoms, pain and hæmorrhage, and confirmed or disproved by exploratory nephrotomy. The uncertainty of a diagnosis based upon symptoms is well illustrated by the experience of Henry Morris,¹ who reports forty-four nephrotomies for suspected stone in which no stone was found. It is well known that the symptoms, pain, hæmorrhage, pyuria, albuminuria, etc., belong to many other pathological conditions that may be present in the genito-urinary tract. When a stone is the cause of these symptoms, they arise as a result of the *functional disturbance or pathological changes* usually the result of infection in the kidney or ureter induced by the presence of a calculus and not by the stone *per se*. Since calculous formations give rise to symptoms only after pathological conditions have been brought about in the kidney, and since these changes bear no constant relation to the symptoms they produce, it often happens that extensive damage has been done to the kidney tissue before a symptomatic diagnosis can be made. Furthermore, the size and character of the stone bear no constant relation to the severity of the symptoms produced.

In 1899, Abbé² collected from the literature and tabulated twenty-five cases in which a positive diagnosis had been made by the X-ray and later confirmed by operation. To this list of twenty-five he added two cases of his own, making twenty-seven cases reported to that time. These twenty-seven cases are arranged by years as follows

1896 McInty¹, of Glasgow, reported the first skiagraph of a stone taken in the body Swain, of Bristol, reported a case

1897 Gurl, Nuremberg, Fenwick, England, Thyne, Australia

1898 Bevan, Chicago, McArthur, Chicago, Lauenstein, Germany, Alsborg, Germany, Martin, England, Taylor, England, Fenwick, England, Leonard, Philadelphia, eight cases, McBurney, New York, Abbé, New York, two cases

1899 Wagner, Germany, two cases

The percentage of error in the positive diagnosis of renal calculus by the Rontgen method is still undetermined, because of the variations in the methods used, the skill of the operators, and the differences in the patients whose cases have been reported In 1898,³ Lauenstein pointed out that up to that time only oxalate stones were thought to show, and cited a case in which a definite shadow of a stone consisting of calcium carbonate, chiefly with some calcium oxalate and uric acid, was obtained In 1899,⁴ Ringel, as a result of his work, laid down the following propositions

- 1 By the Rontgen procedure only the rather infrequent oxalate stone shows with certainty

- 2 The showing of other kinds of kidney stones which are more permeable for Rontgen rays succeeds only under certain favorable conditions, such as the presence of a very large stone or the presence of a very permeable patient

- 3 The Rontgen ray is to be employed in every case of kidney stone as a means of diagnosis Reliance is to be placed, however, only upon a positive result, while, from the failure to obtain a kidney stone shadow, the absence of a kidney stone should not be concluded

Leonard,⁵ in 1900 and 1901, reports the development of a technique by which he was enabled in the examination of 136 cases to positively diagnose kidney stone in 100, with a known error in but one case, and error of 1 per cent He does not describe his technique beyond stating that he uses a self-regu-

lating tube of rather low vacuum with a large volume of X-rays. He⁶ lays down the dictum that "Accuracy in the negative diagnosis can only be assured by the development of a technique capable of producing negatives in which a differentiation can be made between shadows of tissues less dense than the least dense calculus."

In a later report of 300 cases examined,⁷ Leonard found calculi in 86, 28 per cent. Of these 86 cases 50 per cent were in the ureter. In five of the 300 cases no stone was found at operation, though diagnosed positively by the X-ray. He gives no report as to the number of his positive diagnoses which later came to operation. Of those that *were* operated no stone was found in five cases. In all probability a large number of the cases diagnosed positively were not operated, and of these we do not know how many would have proven negative at operation. He concludes that "a negative diagnosis is as accurate as the positive," and that "operation is contraindicated when no shadow is shown by the X-ray unless some other pathological condition is present."

Kummel and Rumpel⁸ report a series of eighteen cases diagnosed positively by the X-ray, all of which were subsequently operated and stone extracted. The conclusions drawn from their work are as follows:

- 1 The exact diagnosis of kidney stone is to be made only by means of the Rontgen procedure.

- 2 The presence of a kidney stone, whether located in the kidney substance, the calices, or in the ureter, will be demonstrated upon the plate in every case by proper application of the Rontgen method.

- 3 The negative result of the Rontgen method after repeated attempts allows the exclusion of a calculus.

- 4 The demonstration of a stone shadow upon the Rontgen plate is not dependent upon the size and chemical composition of the calculus, but singly and alone upon the technique of the Rontgen operator.

- 5 A high degree of corpulence in the patient may render the demonstration of a calculus by the Rontgen method very difficult, but in general does not render it impossible.

6 In every case of nephrolithiasis it is advisable to employ the functional methods of investigation, since they show us by combined application (*a*) whether a disturbance of the whole kidney function exists or not, (*b*) whether we have to deal with a double-sided stone formation or other co-existing kidney disorder, or whether in the already existing disorder only one kidney is involved

7 The result of the negative Rontgen investigation should be considered in connection with the condition of the clearness, concentration, and freezing-point of the urine obtained by means of the ureteral catheter

. In the eighteen cases tabulated by Rumpel,⁹ two of the stones removed contained only triple phosphates. All the others consisted of mixtures in different proportions of calcium carbonate, calcium phosphate, calcium oxalate, and uric acid or urates. Five of the stones consisted largely of calcium oxalate, fourteen of calcium phosphate, and two of uric acid. Of the two stones consisting largely of uric acid, the composition of the first was a mixture of uric acid with calcium phosphate, and of the second a mixture of uric acid with calcium oxalate and calcium phosphate

In twenty-seven cases of suspected kidney stone operated upon by Bevan at the Presbyterian Hospital during the last two and a half years, in which the writer has had the opportunity to employ the X-ray as a means of diagnosis, it has been possible to make a positive diagnosis of calculus in thirteen cases, a doubtful diagnosis in one case, and a negative diagnosis in thirteen cases. In the doubtful case operation revealed a single, thin, flat, oxalate stone the size and shape of a pumpkin seed lying well up under the last rib. More careful examination of the skiagraph in this case showed a rather vague shadow directly over the last rib. The failure was due perhaps more to an error in the interpretation of the skiagraph than to the skiagraph itself

In the thirteen cases in which a negative diagnosis was made, the following conditions were found at operation: Tuberculosis, five cases, pyonephrosis, two cases, essential

renal hæmorrhage, two cases, cystonephrosis, one case, hydronephrosis, one case, polycystic kidney, one case, hypernephroma, one case

The technique of the Rontgen method has been developed by the contributions of many workers both in this country and in Europe. Drs O Rumpel and Albers-Schonberg, of Germany, deserve special mention for having done much to develop the technique of the application of the Rontgen ray in the diagnosis of renal calculi. The essentials in the technique of skiagraphy as applied to the diagnosis of kidney stone may be briefly stated as follows:

The apparatus required consists of a coil capable of giving a heavy spark from ten to twenty inches in length, a tube with an adjustable vacuum capable of carrying a heavy secondary discharge from the coil and having a comparatively low vacuum, fresh plates thickly coated to secure the largest degree of absorption of the rays.

O Rumpel¹⁰ has pointed out the necessity of using soft tubes to secure the greatest possible degree of differentiation. He recommends "the longest possible exposure with the softest possible tube." The developer used must be one that permits long development with a minimum degree of fog. Glycin and edinol are to be especially recommended.

The patient to be examined should be given a cathartic some hours before the exposure is to be made, and he should also refrain from eating solid food for a few hours in order that the gastro-intestinal tract may be as empty as possible. Eppinger¹¹ has recommended dilating the colon when it is desired to examine the right kidney or the stomach if a skiagraph of the left kidney is desired. He states that by this dilatation the overlying omentum and intestines are pushed aside and an air-space interposed, thus making possible a more definite outline of the kidney region.

The patient having been prepared upon the table as shown in Fig. 1, a skiagraph is taken which includes the entire area from the pelvis to and including the last two ribs. The tube is enclosed in a tube-sheath which rests upon a wooden disk faced

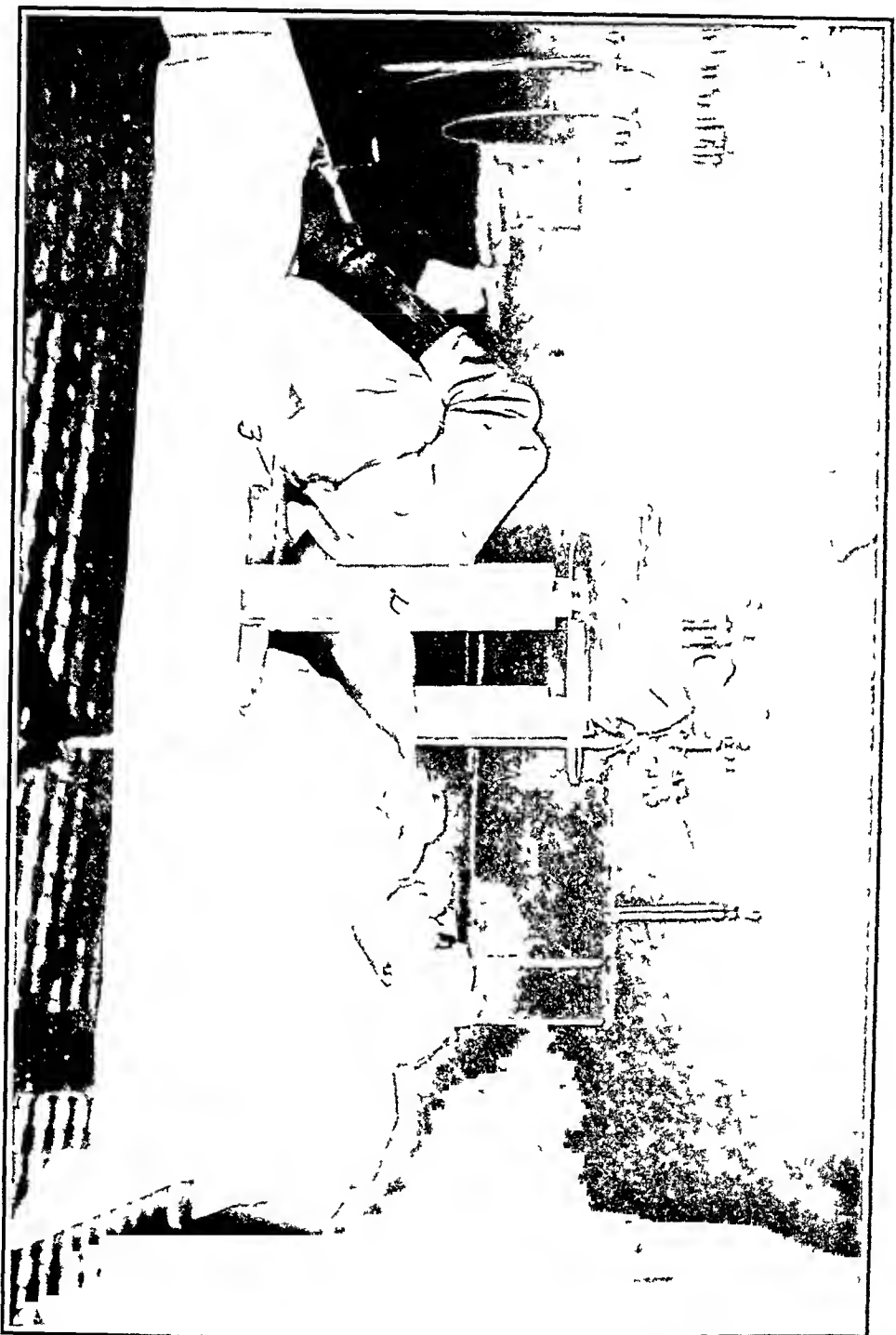
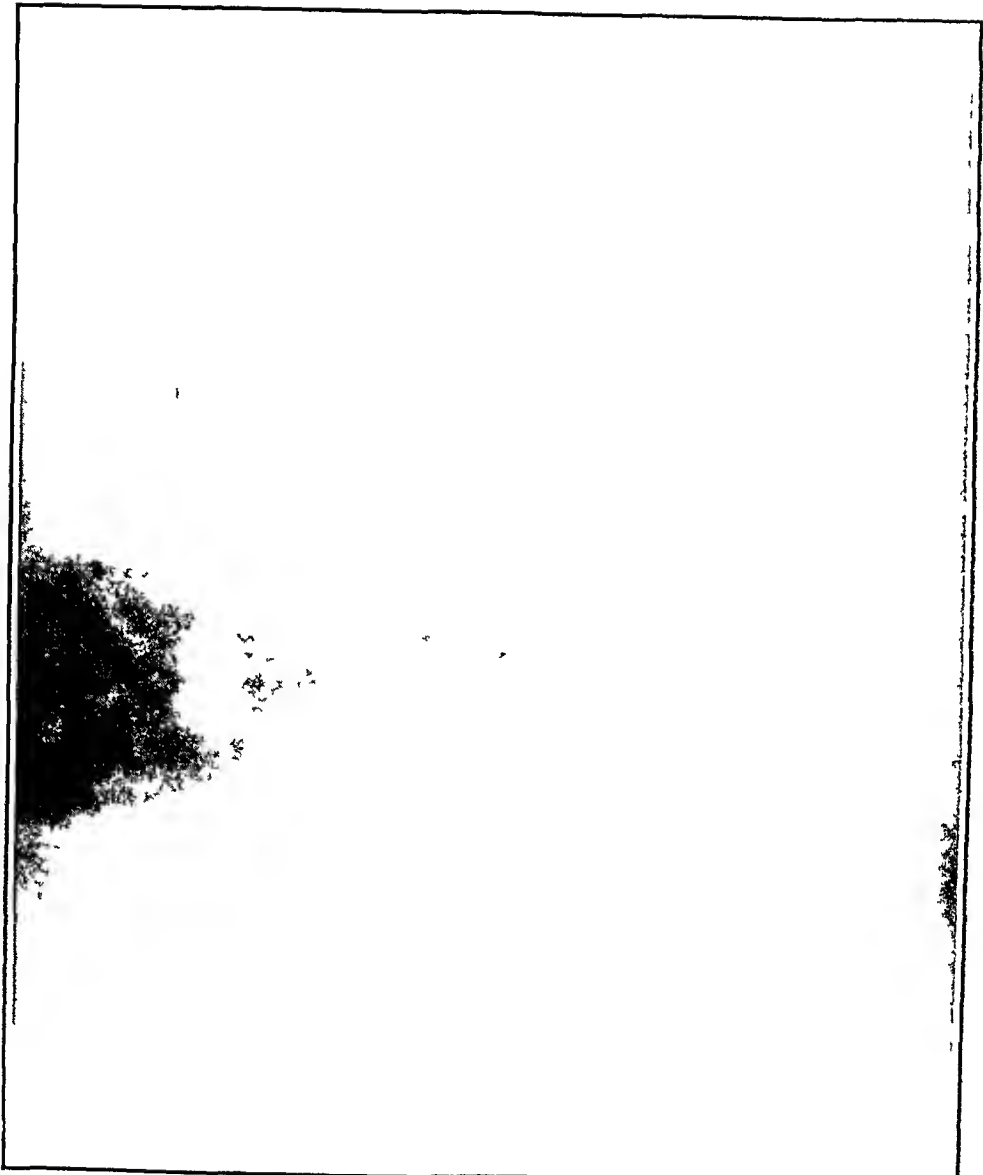


FIG. 1.—Apparatus arranged for taking a skiagraph of entire kidney region. 1. Tube in tube holder. 2. Sheet with circular top faced with lead plate one sixteenth of an inch thick, having an opening three inches in diameter. 3. Steel plate one eighth of an inch thick supporting sensitive plate.



FIG 2 —Lead cylinder apparatus of Albers Schonberg

Left



Right

FIG 3 —Four stones in left kidney

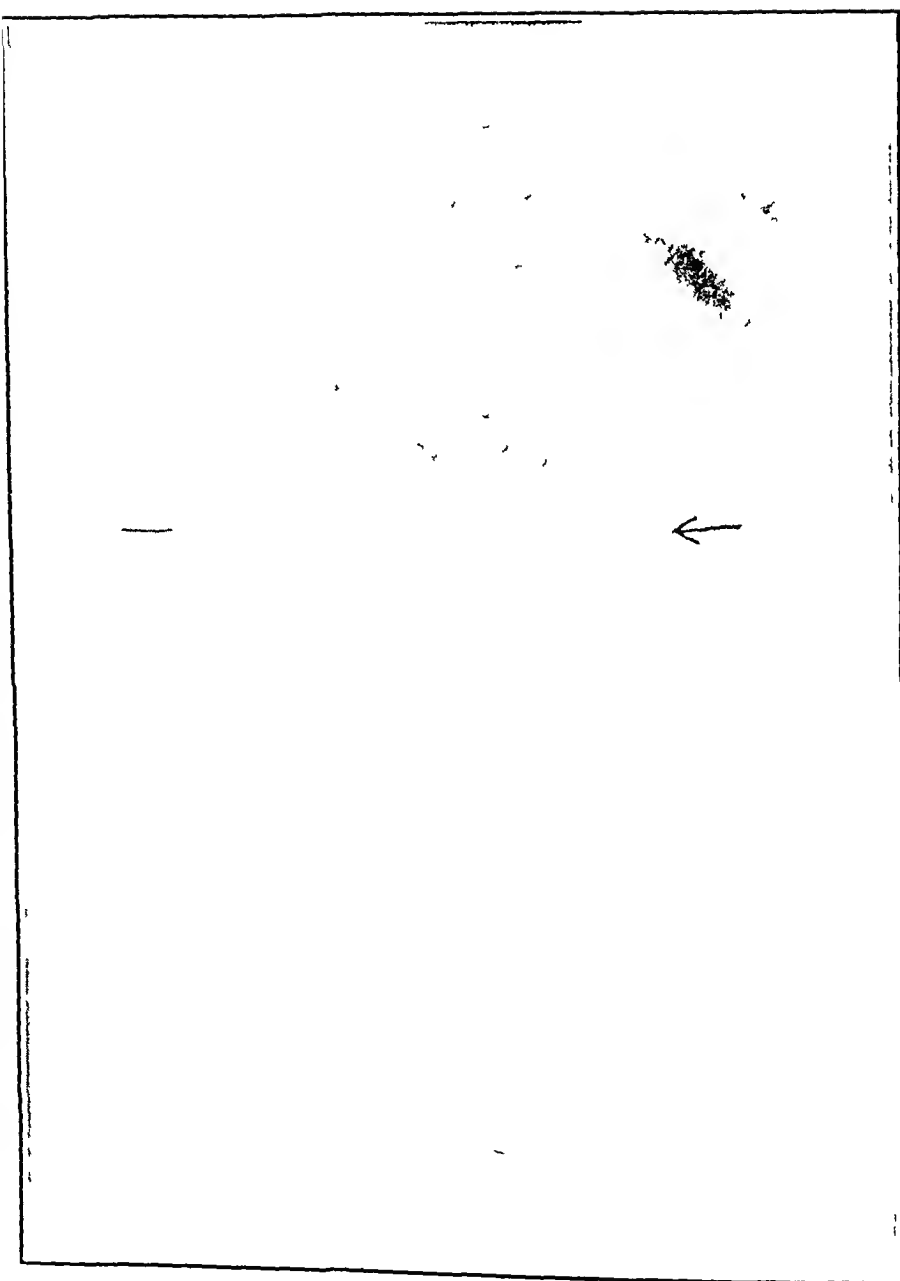


FIG 4—Single small stone in right kidney

below with a lead plate having a circular opening three inches in diameter. This lead plate or diaphragm cuts off all the rays except those that come from the centre of the tube, thereby increasing the sharpness and clearness of the image. The patient is placed upon the table with thighs flexed upon the abdomen and head elevated so as to bring the back as closely in contact with the plate as possible. Hard pillows or sand-bags may be used to support the knees and head. The sensitive plate, supported by a heavy, flat, steel plate, is placed beneath the patient. The steel plate, besides giving support, obstructs any extraneous rays that may be given off by objects beneath the patient.

If it is desired to secure a still clearer picture of any part of the field, the apparatus devised by Albers-Schonberg, as shown in Fig. 2, is employed. Rumpel and Albers-Schonberg have shown that much of the failure in kidney-stone work is due to the diffusion of the rays in passing through the tissues, and that by the use of lead diaphragms or lead cylinders the extraneous rays may be cut off and much of the diffusion and consequent loss of detail avoided. The pressure of the heavy lead cylinder serves to diminish the respiratory motion of the abdominal organs, and also to materially reduce the thickness of the patient. Albers-Schonberg¹² lays down the following as the features that should characterize a good skiagraph of the kidney region:

- 1 It must show the transverse processes of the vertebræ
- 2 It must show the last two ribs with structure
- 3 It must enable one to differentiate the border of the psoas muscle from the quadratus lumborum

When the lead cylinder is used, it is necessary to take two or three different negatives in order to cover the field of the kidney and ureter. This disadvantage is more than compensated by the gain in clearness of detail obtained by this method, especially in cases where doubtful or small shadows have been obtained in a general view of the entire region taken by the ordinary method.

In corpulent persons the pressure of the lead cylinder apparatus gives a considerable diminution in the thickness of

tissue to be penetrated by the rays, thereby shortening the exposure and diminishing the loss of detail by diffusion

For diagnostic purposes, the plates themselves and not prints made from them should be relied upon as being of most service, since no print preserves the detail and delicate gradations of the original negative. The negatives should be examined by placing them in a window and observing them by reflected skylight or in an apparatus illuminated by incandescent electric light reflected from white surfaces. The use of an opera-glass, as suggested by Kummel, is often very useful in the examination of a plate, because it limits the field of vision to the size of the plate when the observer stands six to ten feet away.

The Rontgen ray skilfully and properly applied makes it possible to make both positive and negative diagnoses of renal calculi with a very low percentage of error. It also gives much valuable information as to the size, number, and location of stones when present (Figs 3 and 4), and enables the surgeon to approach an operation for nephrolithiasis with an exactness of knowledge not possible before the introduction of the X-ray as a means of diagnosis in diseases of the kidney.

REFERENCES

- ¹ Morris Hunterian Lectures, 1898
- ² Abbe ANNALS OF SURGERY, Vol xxv, p 178
- ³ Lauenstein Deut Zeit fur Chirurg, Band I, p 195
- ⁴ Ringel Archiv fur klin Chirurg, Band lxx, p 167
- ⁵ Leonard ANNALS OF SURGERY, 1900, Vol xxxi, p 163, 1901, Vol xxxiii, p 435
- ⁶ Leonard Philadelphia Medical Journal, February 1, 1902
- ⁷ Leonard Medical News, June 9, 1904
- ⁸ Kummel and Rumpel Beitrage fur klin Chirurg, 1903, Band xxxvii, Heft 2
- ⁹ Rumpel Die Diagnose des Nierensteins
- ¹⁰ Rumpel Die Diagnose des Nierensteins
- ¹¹ Eppinger Fortschritte auf dem Gebiete der Rontgenstrahlen, Band vii, Heft 1
- ¹² Albers-Schonberg Die Rontgentechnik, p 191

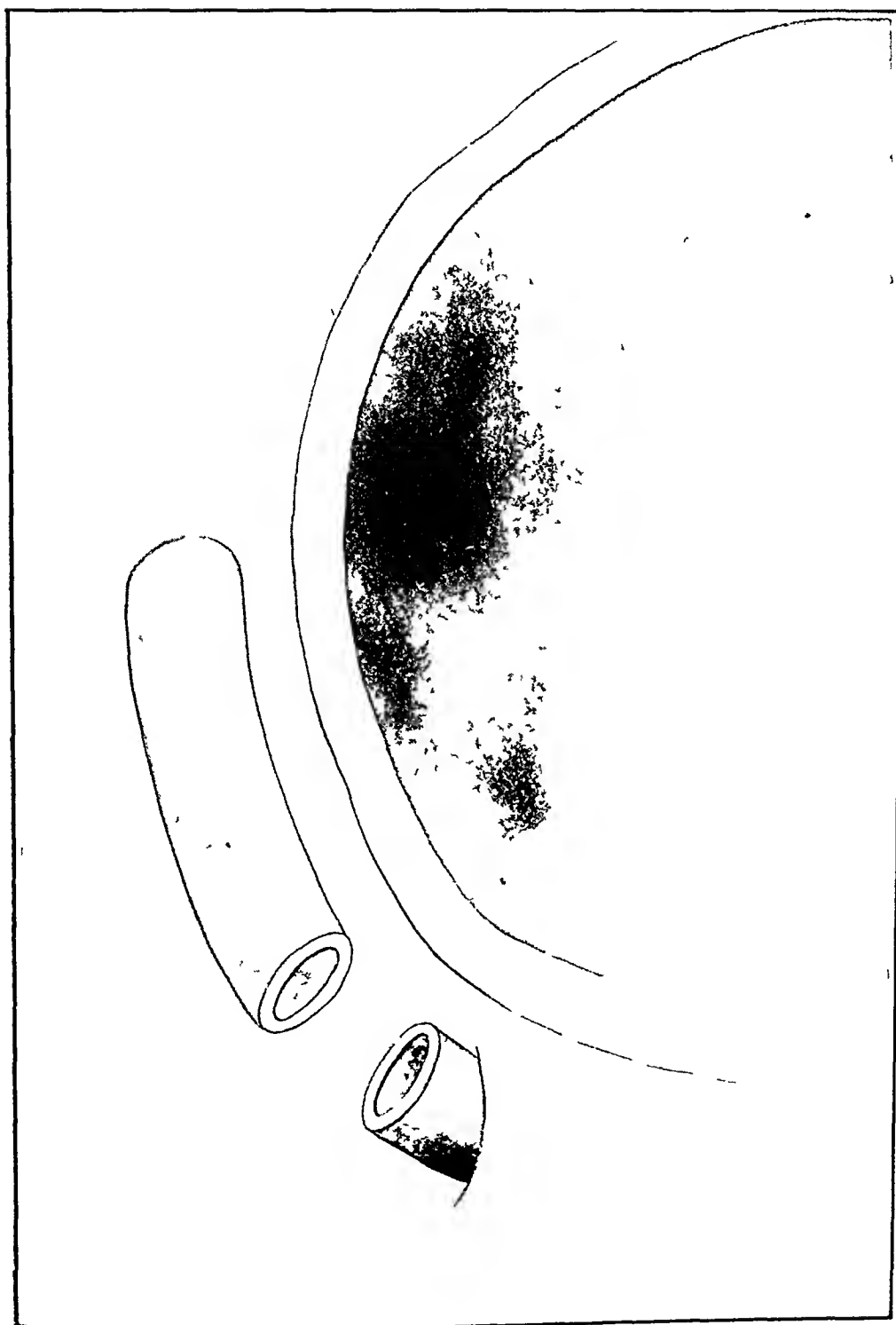


FIG. 1 —Ureter accidentally cut in vaginal hysterectomy. The upper cut end leads from the kidney, the lower end to the bladder. Semidiagrammatic.

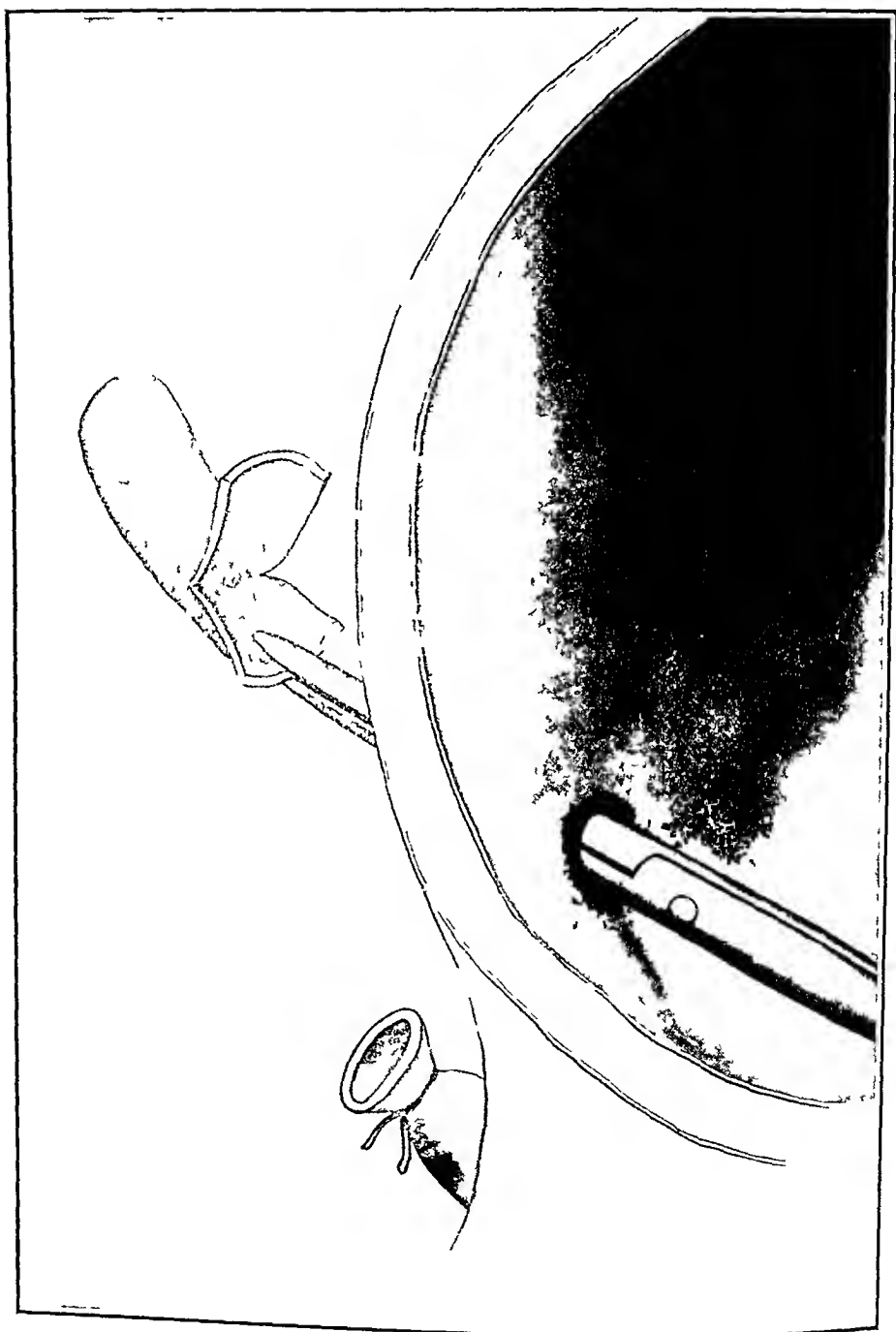


FIG 2—The upper cut end of the ureter split and in the grasp of a forceps which has previously made an opening from the interior to the exterior of the bladder by puncture
Semidiagrammatic

URETEROCYSTOSTOMY FOR ACCIDENTAL WOUND OF THE URETER IN VAGINAL HYSTERECTOMY.¹

BY E C DUDLEY, M D ,
OF CHICAGO,

Professor of Gynecology, Northwestern University Medical School

ON April 22, 1903, I performed vaginal hysterectomy for carcinoma of the corpus uteri upon a woman seventy years of age, a patient of Dr. Loid, of Plano, Illinois, whose pelvic organs long since had passed into extreme senile atrophy. In making the opening into the peritoneal cavity between the bladder and the uterus, the carcinomatous disease was found to have extended so far anteriorly that the bladder was opened immediately in front of the cervix uteri. An opening into the peritoneum posterior to the uterus was made without accident, the broad ligaments were then isolated and cut close to the uterus and the uterus removed. After cutting through the right broad ligament, a spurt of fluid was observed, which upon examination proved to have come from the right ureter, showing that the ureter had been divided. This accident to the ureter was consequent upon the fact that the cicatricial tissue of an old cervical laceration had caught it and drawn it into such close relation with the uterus that it came in the line of the incision (Fig. 1).

After a hasty consultation with Dr. Kolischer, who chanced to be present, it was decided, if possible, to establish a direct communication between the upper cut end of the ureter and the interior of the bladder. The usual method of performing this operation is to make an opening into the bladder, push the end of the ureter through, and fasten it there by means of sutures. Appreciating the well-known tendency of the cut end of the

¹ Read before the Chicago Surgical Society, February 1, 1904.

ureter to contract when introduced into the bladder in this way, and having at hand a vesicovaginal fistula which rendered the interior of the bladder quite accessible, I made use of a method which, so far as I know, had not been described. With a long slender forceps I punctured the bladder wall from within outward at the point nearest to the cut end of the ureter. Then after splitting the cut end of the ureter and denuding the bladder mucosa on either side of the punctured opening, I drew the ureter into the bladder (Figs 2 and 3), and stitched it there by means of fine chromic catgut sutures (Fig 4). By this means the split end of the ureter was held widely apart by means of sutures, so that it could not easily contract, and form a stricture. The tightly fitting ureter made the punctured bladder wound water-tight.

The vesicovaginal fistula was closed immediately by drawing the anterior margin of the peritoneum down to the lower margin of the vaginal wound and fastening it there with a continuous chromic catgut suture. In like manner the posterior margin of the peritoneum was brought into contact with the vaginal margin of the wound, after which the wound from the peritoneal cavity into the vagina was closed in the usual way, the stumps of the broad ligaments being drawn down into the vagina and fastened there by means of sutures, one at each end of the vaginal wound. During the two weeks following the operation, the bladder was kept empty by the continuous use of a self-retaining catheter.

Cystoscopy by Dr Kolischer and myself some weeks later showed a perfectly patulous opening of the ureter, the divided flaps of which were firmly united to the bladder mucosa.

The special advantages of the method, as already pointed out, are twofold. 1. A water-tight wound around the ureter where it enters the bladder. 2. Security against contraction of the end of the ureter where it enters the bladder. These advantages in a similar case would lead me to repeat the operation if the bladder happened to be opened, and I would be inclined to make an artificial vesicovaginal fistula for this purpose if the bladder was not open.

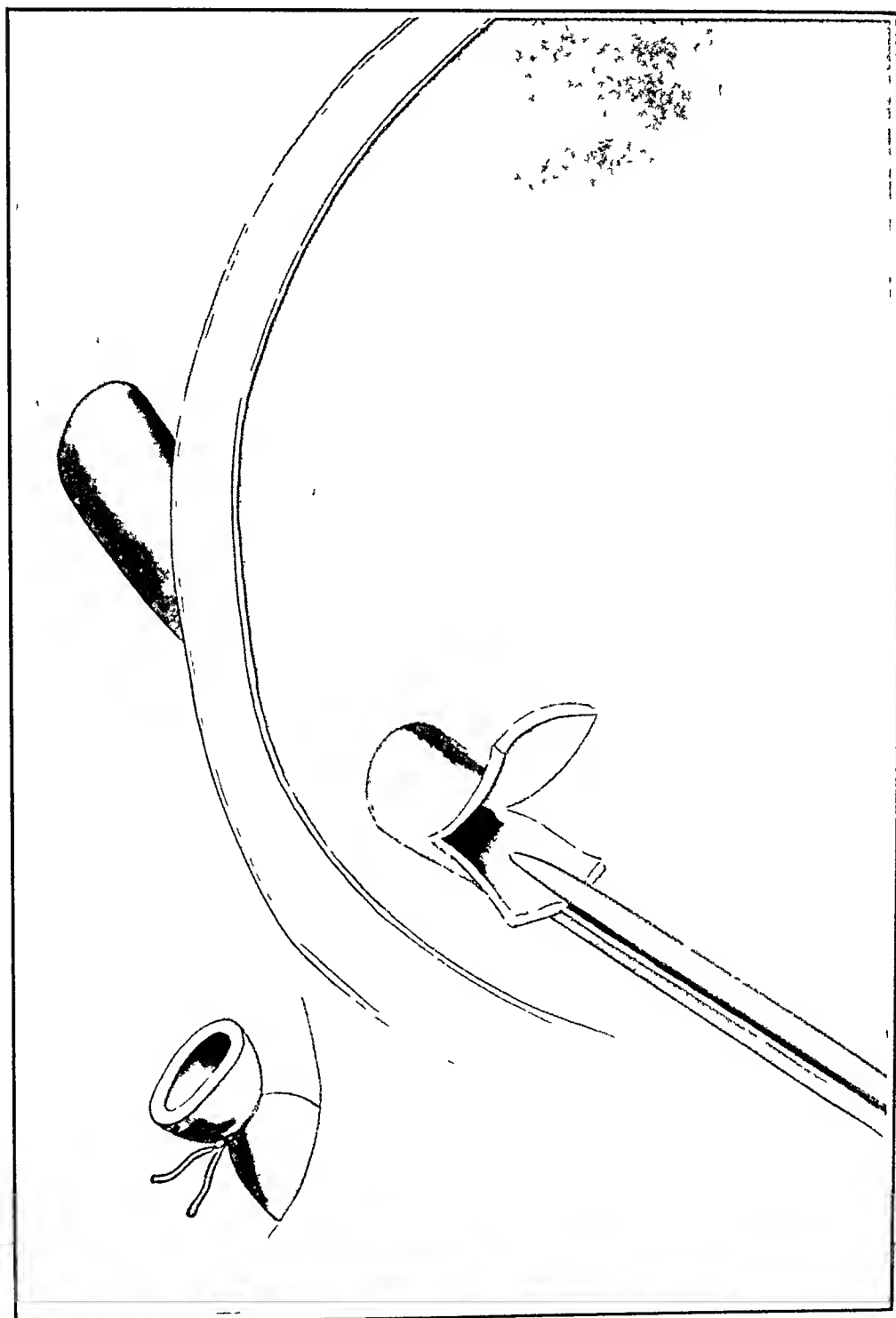


FIG 3 —The split end of the ureter has been drawn into the bladder by means of the forceps
Semidiagrammatic

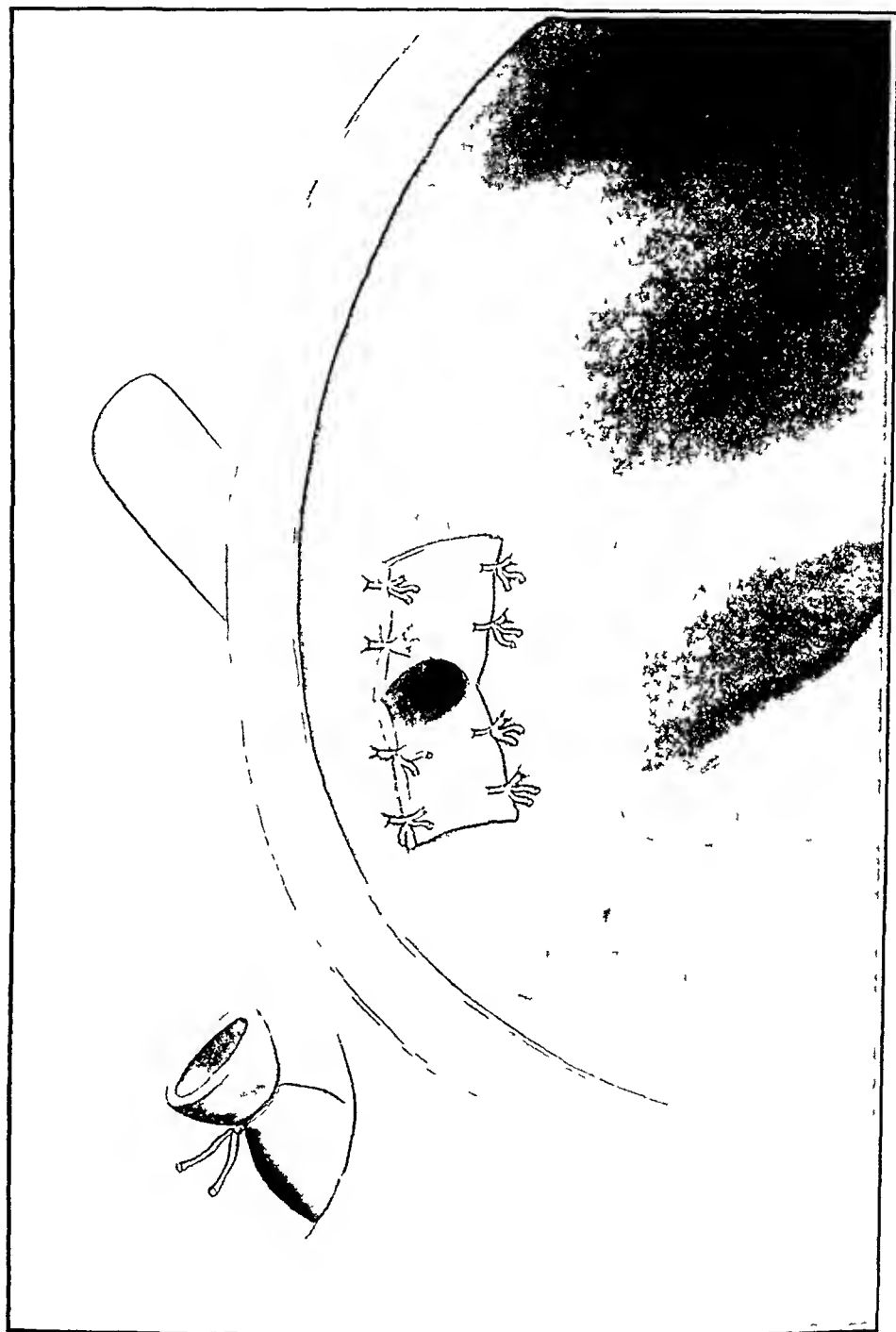


FIG 4 —The split end of the ureter having been drawn into the bladder and the bladder mucosa having been denuded on either side of the opening, the two flaps are fastened to the scarified mucosa by means of sutures three on each side

INJURIES TO THE AXILLARY VESSELS OCCUR- RING DURING OPERATIONS FOR CAR- CINOMA OF THE BREAST

BY RICHARD R SMITH M D,
OF GRAND RAPIDS, MICHIGAN

RECENTLY, while operating for carcinoma of the breast, in severing the pectoralis minor and the underlying fascia from the coracoid, I accidentally drew the axillary vein into the bite of the scissors. As a result, a transverse cut, involving about a third of the vessel's circumference, was produced. A catgut ligature, completely occluding the lumen, was at once placed above and below the defect, and the operation proceeded in the usual way. An uneventful recovery followed, no circulatory disturbance of any kind being noted. The patient was seen for the last time three weeks after operation.

Upon seeking information in regard to similar injuries, I found very little that was satisfactory. The text-books mentioned the subject only in a casual way, and a review of the articles on carcinoma of the breast published during the last five years gave little bearing on it. Thinking that the collective experience of a number of operators would be of interest and of value in determining the results of such injuries, I sent a letter to a considerable number of American surgeons asking for the number of cases which they had, which vessel was injured, how the accident occurred, how it was treated, and what was the result. I received replies from seventy-one. Of these, forty-four had never injured the axillary vessels, twenty-seven reported one or more cases.

The following are abstracts of the letters received.

BECK, CARL, New York. One case in which there was an extensive glandular enlargement in the axilla, the vein being embraced by the glands. "There was some technical difficulty

but the case did well" He has had to ligate the vein four or five times, never the artery

BLOODGOOD, JOSEPH C, Baltimore We have had 300 or more complete operations As far as I can recollect, there has not been a single injury to the artery On a few occasions, two or three, the vein has been torn, but in each instance immediately sutured We have had therefore no complications whatever from injury to vessels On four or five occasions we have deliberately excised large portions of the vein because a gland or two was adherent There have been no complications following such a dissection In a careful denudation of the axilla for cancer of the breast, I am inclined to think that injury of the axillary vein or artery should be a very rare accident Adhesions to the vein and artery are present only in a slight number of cases, and even here, if the dissection is carried on slowly and carefully, a complete operation may be performed without difficulty

BULL, WILLIAM T, New York He has no notes of such cases, but recalls indistinctly having once cut the axillary vein nearly across in dissecting away some adherent glands No ill results followed

COE, HENRY C, New York He has seen the axillary vein punctured in dissecting out the sheath in three or four cases without bad results In one of these cases the vein was ligated, in another it was tied at the side without occluding the lumen

DEAVER, JOHN B, Philadelphia He has injured the axillary vein in a number of cases, and has repaired the injury by a lateral ligature He has excised a portion of the axillary vein in bad cases When it is difficult to practise lateral ligature or when there is some uncertainty about its retention, he puts on a forceps which does not occlude the lumen, this forceps is removed the third day He has always had good results, both immediate and ultimate, in all his cases

GERSTER, ARPAD G, New York "Numerous instances" He has never injured the vein accidentally Avoids this by a very free exposure of the field and of the large vessels above and below over the region holding close relation with the tumor Never dissects separate adherent glands from the axillary vein, but prefers to excise the adherent portion of the vein in one piece with all fatty and glandular contents of the axilla, this being done, of course, after preliminary double ligature of the vein above and

below the parts to be excised. No ill consequences following the interruption of the venous current. A slight œdema occurred very rarely. Healing progressed normally.

HARRINGTON, FRANCIS B., Boston. Harrington has once or twice cut off one of the branches so close to the axillary vein that it has been necessary in tying to diminish the size of the lumen in the main vessel, but without actually occluding it. He has never recognized any bad results from this cause. He believes that the vein can be sutured with fine silk without producing a thrombus or interfering with the blood current.

HENROTIN, FERNAND, Chicago. Out of probably 150 cases of cancer of the breast, he has never torn the vein wide open. A few times he has injured it so that it gave rise to a good deal of hæmorrhage, but he has been able to catch the tear with a Billroth forceps and to throw a fine catgut ligature around it sufficiently secure to stop the hæmorrhage. No mention of results was given.

JEWETT, CHARLES, Brooklyn. He has never injured the axillary vessels directly. In two cases marked œdema developed several weeks after operation, and he believes that this came from obstruction to the vein caused by contraction of scar tissue. The œdema was permanent. In both these cases the patients died from metastatic growths.

McBURNEY, CHARLES, New York. One case. Case of recurrent carcinoma of the axilla. Deliberate and intentional resection of about two inches of the axillary vein. Enlarged mass of carcinomatous tissue entirely surrounding and densely adherent to the vein. Vein ligated above and below and intervening section removed. Recovery uneventful. Œdema of the arm expected, but did not occur. McBurney remarks that the arrangement of the veins is really so varied that the ligature of what appears to be a full-sized axillary may cause little or no interference with the current. Modern aseptic methods have done much to remove the danger which formerly existed when the axillary vein or artery was ligated.

MARCY, HENRY O., Boston. Two cases of suture of the axillary vein without untoward result, the circulation being unimpaired after the suturing. He uses a very fine kangaroo tendon continuous suture. A double continuous suture preferred where it can be easily applied. Suture applied in such a way as to leave

the inner surface of the vein smooth. He has also applied this method to the common iliac and twice to the femoral vein. All his injuries were accidental. In all he has had good results, the circulation being undisturbed.

MAYO, W J and C H, Rochester, Minnesota. Have twice injured the axillary vein and once the subclavian. Two cases were treated by a suture of fine catgut, the wall of the vein was puckered up considerably, but no trouble followed. The third was a lateral ligature applied to cover a defect made in the main vessel by cutting off a branch close to its wall. The ligature was applied with a needle to prevent slipping. No swelling of the arm occurred in any of these cases.

MEYER, WILLY, New York. One case. A patient with far advanced axillary involvement. Resection of the vein seemed contraindicated. The long thoracic vein tore off just at its entrance to the axillary vein during the attempt to loosen the glands from the vessel. The bleeding point was grasped with mouth-toothed artery forceps. By pulling the lower wall of the vein downward and upward he succeeded in placing a lateral ligature. Patient recovered.

MONTGOMERY, E E, Philadelphia. One case. Controlled by lateral ligature. The accident was produced by dissecting off some glands which lay directly on the surface of the vein. Patient subsequently had gangrene of the thumb on the opposite hand, from which she died.

MORRIS, ROBERT T, New York. Two cases of tear in the axillary vein,—one was small and was closed with purse-string suture, the other was nearly one-half an inch long and was closed with running catgut. Both patients made a good recovery. He states that it is a common thing to see some swelling of the arm on account of the removal of lymph vessels, and that one would have some difficulty in determining if any part of the swelling was due to the interference with venous return.

MURPHY, J B, Chicago. Two cases. One, a tear with the finger, producing a considerable opening in the vein. This was done while endeavoring to separate a firm adhesion from the gland which was the seat of a "mixed infection." In the other case the injury was done with the scissors, he not having recognized the wall in its location, compressed between two large glands. In each of these cases he made a continuous suture with

catgut, and in each there was recovery without thrombus so far as could be determined by the circulation of the arm. The largest laceration of the vein which he ever made was by putting his entire thumb into the subclavian in removing firmly attached tuberculous glands. There was a gush of blood when the thumb was removed. It was immediately reinserted, and kept there while he grasped the edges of the vein at one angle with forceps and kept applying one forceps after another until he had five of them on the rent. When the thumb was entirely withdrawn, the vein was closed by an over-and-over stitch with catgut, the threads passing between each of the forceps, the thread being pulled taut as the forceps was withdrawn. Patient made an uneventful recovery. This occurred shortly after his experimental work with arterial suture, otherwise he believes he would have had a serious time with his patient.

NANCRLDE, CHARLES B., Ann Arbor, Michigan. Case 1. Recurrent axillary growth. Injury to the axillary vein. The vein secured with some difficulty between two ligatures. No harm resulted. Case 2. Recurrent axillary growth. Injury to the axillary vein or the subscapular vein close to the main vessel, thinks the former. Secured by ligation after considerable bleeding.

OCHEINER, A. J., Chicago. He has many times injured the axillary vein by cutting off one of the branches too close to the main vessel during dissection. The main vessel has been torn a little in trying to catch and ligate the bleeding point. In one case, having torn into the axillary vein and having attempted to place a lateral ligature, he was obliged to ligate the whole vein. There was some œdema of the arm for one month, after which the trouble disappeared without leaving any bad effects.

PARK, ROSWELL, Buffalo. Two cases. Park has twice applied sutures of fine silk to injuries to the axillary vein, and once has left hæmostatic forceps on either the axillary or subclavian, he could not exactly tell which, but thinks the latter, because he was working through an opening near the clavicle. All three cases did well. In the case in which forceps were used, they were removed in forty-eight hours without further hæmorrhage.

POWERS, CHARLES A., Denver. Has been obliged to completely ligate the axillary vein three times, and in six or eight

other occasions has put on a side ligature He has never had definite trouble follow

RICHARDSON, MAURICE, Boston In probably 500 dissections of the axilla he has been obliged to resect the vein two or three times This was made necessary by the disease When there was simply an injury to the axillary vein, he has been able to make a satisfactory suture There were no ill consequences in any of his cases

SENN, NICHOLAS, Chicago Several cases in which the vein was excised A passive oedema was the only immediate ill result

STONE, ISAAC S, Washington, D C One case One of the branches of the axillary vein torn from the main vessel A clamp applied to the tear and a ligature carefully placed in order not to include much of the large vein and occlude its lumen A slight swelling of the arm occurred Patient made an excellent recovery

VAN HOOK, WELLER, Chicago Has several times injured the axillary vein, and has succeeded in putting on a lateral ligature except when the vein was involved in growing carcinoma, and when in consequence a portion of the vein had to be removed He has never seen any ill results He does not think that injuries to the walls of large veins in aseptic wounds are feared by experienced surgeons He believes such injuries are of common occurrence, and, in the absence of suppuration, are followed by no ill consequences

WARREN, J C (by Walter B Odiorne), Boston One case Carcinoma of the breast with involvement of axillary and cervical glands Both axillary and supraclavicular glands were removed Two years later, during a secondary operation for the removal of an enlarged gland just above the clavicle, this being the first sign of recurrence, an injury occurred to the subclavian vein The clavicle had been previously divided The profuse hæmorrhage was controlled by tying both ends of the divided vein Absolute rest of the arm for several weeks, during which time there was considerable swelling, but this subsided, and patient regained entire use of arm Died one year later of "general recurrence" The presence of old scar tissue, which made the dissection very difficult, was the cause of the accident

CUSHING, ERNEST W, Boston One case Was present when one of his assistants, in attempting to remove a malignant

growth from the axilla, punctured the artery. There was a tremendous gush of blood, the subclavian artery was compressed, and he applied a clamp to the injured vessel. The clamp was left in place eight days. As the injury was high up in the course of the artery, it was deemed best not to apply ligature, but to allow the forceps to remain, since it controlled the hæmorrhage perfectly. The arm became pulseless and was somewhat swollen. It was kept warm artificially. The recovery, as far as the arm was concerned, was quite satisfactory, but the patient lived but two months, dying of extension of the malignant disease into the pleural cavity.

MCARTHUR, L. L., Chicago. Has never injured the axillary vessels during operation for cancer of the breast, but once saw the artery cut, together with one branch of the brachial plexus, in an operation by his house surgeon on a child two years old. The operation was undertaken for tubercular glands of the axilla, secondary to vaccination. In this case the collateral circulation was sufficient to maintain the circulation in the arm. The final outcome of the accident to the nerve is not known.

MEYER, WILLY, New York. One case. During an operation for recurrent, glandular, axillary carcinoma, after amputation of the breast, the long thoracic artery was torn away from the main vessel close to the latter's wall. An attempt was made to suture the vessel, but the arterial wall yielded so little that he deemed it wiser to ligate the artery above and below the bleeding point and divide between the ligatures. With elevation of the arm during after-treatment, the patient recovered without any trouble, and could use the extremity during the remainder of her life.

MURPHY, JOHN B., Chicago. Has never injured the axillary artery during the operations for cancer of the breast, but had a bullet wound of the first portion of the axillary artery just beneath the clavicle. Resected the artery and invaginated the proximal into the distal end with silk sutures. There was immediate return of pulsation of the radial, and the patient recovered without serious disturbance of the circulation of the arm, and has remained well.

RICHARDSON, MAURICE, Boston. One case. Operation for malignant disease. A part of the lumen of the artery was destroyed. The hole in the vessel was closed with two or three

sutures No bad results followed There was never aneurism The woman died some time later with recurrence of the cancer

It was my original intention to tabulate the cases reported, but this was impossible, since the answers, given usually from memory, were often incomplete, the exact number of cases and the particular line of treatment applied to each case being oftentimes unknown On reading over the replies, however, certain facts stand out distinctly, and, as these are the important ones, a word of comment may not be out of place

Vein—There are sixty-three cases of injury to the vein reported This is estimating the expressions "several," "a few," "a number of" to mean three, and "many," or "in numerous instances" to mean four,—as conservative a way of counting as possible In no case did permanently bad results follow injury to the vein,* whether the vein was *wholly* or *partially* occluded with the ligature or forceps In some cases an œdema of the arm is reported, this is usually of slight degree and transient Air embolism did not occur, nor did any septic trouble arise from the resulting thrombosis of the vein It must be remembered that these operations were done under aseptic technique The results of vein injury were not as good before the establishment of modern methods

The cause of injury seems commonly to have been a more or less extensive adherence of cancerous lymphatic glands to the vein wall, making an injury to the vein an easy or unavoidable consequence Where such a condition was found, Gerster states that he never dissects away such glands, but prefers to excise the adherent portion of the vein after double ligature This plan was carried out by several others A considerable number of cases occurred during a secondary operation, an operation which would imply considerable malignant disease in the axilla and usually scar tissue from the previous operation

* See Jewett's letter As complete occlusion of the vein at time of operation is rarely followed by swelling, it would seem that this phenomenon, which is not very uncommon, would call for further explanation

An injury naturally would be more likely to follow Actual occlusion of the vein was often deliberate and made necessary by the extent of the disease Slight injuries occurred accidentally Pricking of the vein wall with a needle was reported frequently, a tearing of the vein wall was common Tearing away one of the branches of the vein was also a common occurrence

Treatment —In order to prevent injury to the vein, a very free exposure is commonly advised and practised Great care in manipulation while removing the axillary contents, especially where glands are extensively involved and adherent, is imperative

Where the injury was slight, an attempt was always made to apply some form of lateral ligature or forceps The vein was either picked up with a forceps and a lateral ligature applied on a needle or otherwise, or a running suture was made Marcy lays considerable stress on the use of a fine kangaroo tendon, leaving the inner surface of the vein smooth He has applied this method to the common iliac and twice to the femoral, and has always had good results, the circulation being undisturbed By others both catgut and silk have been employed, apparently with the same good results A forceps left on for about forty-eight hours was used by Deaver, Henrotin, Stone, and Park When actual occlusion was necessary, a ligature was simply thrown around the vein above and below and tied, the intervening portion was sometimes cut away with the diseased tissue

Artery —Injuries to the artery are naturally much rarer than those to the vein This is undoubtedly due to the less exposed position of this vessel, the strength of its walls, and its easy detection while working near it As with the vein, the injury may be so slight as to suggest closing the defect without occluding the lumen, or it may be such as to make closing the artery imperative In none of the three cases occurring during operation for cancer of the breast, nor in the two cases undertaken for other purposes, was there serious disturbance to the circulation Murphy's case of invagination is of interest A possible complication of the injury to the axillary artery would

be an accompanying injury to one of the main nerve trunks, which lie so close to the artery. This occurred in McArthur's case. Cushing describes the hæmorrhage as being most alarming, and does not wish to have the experience repeated. The material is too meagre to deduce accurate conclusions therefrom, but we may at least say that injury to the axillary artery is not necessarily serious.

Summary—Injuries to the axillary vein occurring during operations for cancer of the breast performed under aseptic methods, are in no way serious. A passive œdema of the arm rarely occurs, and when it does is slight and transient. Slight injuries may be repaired by a lateral ligature or a running suture. A forceps left in place forty-eight hours may be used where the application of a suture is difficult. Where injury to the vein is extensive or when the situation of diseased tissue makes it desirable, it may be boldly tied above and below and the lumen occluded without fear of bad results.

As to injuries to the artery the material is too meagre to allow of definite conclusions. There was no permanent bad result in the five cases reported. Artificial heat during recovery of circulation seemed necessary in the cases where the artery was occluded.

ARTERIOVENOUS ANEURISMS¹

A CASE OF TRAUMATIC ARTERIOVENOUS ANEURISM OF THE COMMON FEMORAL ARTERY AND VEIN—UNSUCCESSFULLY TREATED BY A NEW METHOD OF COMPRESSION—AND FINALLY CURED BY THE PROXIMAL LIGATION OF THE EXTERNAL ILLAC ARTERY EXTRAPERITONEALLY—WITH THE SUGGESTION OF THE APPLICATION TO THUSL ANEURISMS OF THE MATAS METHOD OF OPERATION USED FOR ORDINARY ANEURISMS—AND THE MENTION OF SOME OTHER RECENT METHODS OF OPERATING

BY WARREN STONE BICKHAM, M D,
OF NEW YORK

A YOUNG negro man of about twenty-three years of age, of athletic build and otherwise healthy, was admitted to one of the surgical wards of the Charity Hospital, New Orleans, in 1897, presenting a small, prominent, pulsating tumor, of somewhat oval outline, and about 5 by 6.5 centimetres (2 by 2½ inches) in measurement, situated directly over the course of the common femoral artery and vein, furnishing a marked vibratory thrill and a murmur, and the pulsations ceasing upon compression of the external iliac artery without the contour of the tumor being materially changed thereby. At a period, as nearly as remembered by the writer, of about ten days prior to entrance, he had been shot by a pistol, the ball entering the outer aspect of the left thigh, on a level, approximately, with the spine of the pubic bone, and ranging inward across the front of the thigh. He had gone to bed for a few days, during which he had not suffered especially, and, upon getting up, noticed the enlargement upon his thigh. At the time of his coming into the hospital the wound of entrance had healed entirely, no wound of exit existed, the patient walked into the ward unaided, and complained of nothing but the presence and discomfort of his tumor. The ball could not be located, and no complained-of symptom pointed to its locality.

A diagnosis of traumatic arteriovenous aneurism involving the common femoral artery and vein was made. The contour of

¹ Read before the Surgical Section of the New York Academy of Medicine, March 5, 1904

the swelling suggested the varicose-aneurism type of arterio-venous aneurism, but it is known to be quite impossible, in the majority of cases, to discriminate between the varicose-aneurism type and the aneurismal-vaix type prior to the actual exposure of the tumor in the field of operation. This was found to be so in the four cases operated upon and reported by Treves. It is right to say that there was a difference of opinion, among those who saw the above case, as to whether the artery alone was wounded, or the artery and vein, the majority concurring with the writer in the latter view.

Within the following two or three days, and before any systematic course of procedure was begun, the patient, unaided, and in the presence of a male nurse, urinated the pistol-ball which had inflicted the wound. The ball, as remembered, was one of 32 caliber, and was smooth and not changed in shape by contact with any hard object. The patient had complained of no symptom leading one to suspect the presence of this foreign body within the bladder, and could describe, when questioned, no symptom immediately following the injury suggestive of penetration of the bladder. He gave no evidence of bladder irritation before or subsequent to the expulsion of the ball by the urethra. At the time of its expulsion, he complained to the nurse of an unnatural sensation, there was a temporary stoppage of the flow of urine, and then the ball was forced through the urethra, dropping from the end of the penis into the vessel with a noise as though ejected with some force. It is not plain by what route the ball entered the bladder. Considering the point of entrance and the position, to the outer side, of the party firing the pistol, the most direct route would have been by passing through the thyroid foramen of the innominate bone, but it would be difficult to see how that could be accomplished without greater damage to the vessels than a tearing off of a small part of the roof, or anterior aspect, of femoral artery and vein, which was supposed in this case. And if the ball ranged upward, over the superior border of the pubic bone, by way of the prevesical space, it must have met a very much distended bladder. There was no evidence that a fracture of the innominate bone had been sustained.

The patient was now put to bed, the bowels thoroughly moved and a low diet instituted. Though realizing the usual inefficacy of methods of pressure, these were, nevertheless, tried

Digital compression of the external iliac was first used, and, later, compression with a broad rubber bandage, applied from toes to hip-joint. Then a special form of compression, which suggested itself to the writer, was tried experimentally. The tumor and adjacent regions of thigh and groin were shaved, these parts were then lubricated with vaseline, upon this smooth lubricated surface, extending downward from Poupart's ligament for about fifteen centimetres (six inches) below, and around the anterior half-circumference of the thigh, wet plaster-of-Paris was put, being especially built up about the tumor, and when this had hardened and come away, a reverse cast of the part was obtained. Into that special part of the concavity of this hollow which represented, and was made by, the convex tumor, cotton was closely packed, until very nearly but not quite all of the cavity moulded upon the aneurism had been built up and obliterated. The whole cast was then replaced, so that it fitted very exactly the parts from which it was taken, except that the aneurism did not fully fill its former cupped-out cavity in the cast, but only occupied that concavity to a very small extent. This cast was then pressed well into position, and held firmly in place by a spica bandage, the entire limb being supported by ordinary bandage from the toes, the idea being to bring to bear a considerable degree of firm pressure and compression upon the aneurism by the forcing of it into a smaller, and especially shallower, cup than it had made in the original cast, aided by the purchase, so to speak, which the rest of the clinging cast secured by fitting so accurately the parts upon which it had been moulded. This apparatus was applied upon two occasions and kept on a number of hours, and, while it caused no marked discomfort, no result was accomplished by its use. The writer has not used this method of pressure and compression in any case of simple arterial aneurism, but believes that it might find some field of application in certain cases, provided any method of pressure were to be used at all.

It was now decided to first ligate the external iliac artery proximally, in hope that ligature of the artery above would suffice, and, should this fail, to subsequently ligate the femoral vein below the sac, or upon both sides, as indicated at the time of the second operation, thus giving the patient every chance to maintain his venous circulation intact if the arterial had to be so largely sacrificed as necessitated by ligature of the external iliac. After,

therefore, giving the patient an opportunity to recover from the attempts just described, he was anæsthetized and the external iliac artery tied extraperitoneally, by an incision parallel with and 13 centimetres (one-half inch) above the outer two-thirds of Poupart's ligament, followed by a pushing upward of the intact peritoneum, the artery being readily exposed and ligated with silk. An exceptionally large, flat, lymphatic gland, completely saddling the artery and lying directly over the site of ligation, and rather closely adherent to the sheath of the vessel, was the only complicating feature encountered. The patient was put to bed with the entire limb surrounded with a cotton and gauze dressing from toes to hip, and additional warmth temporarily supplied by hot-water cans. The ensheathing of the limb was retained for about ten days, with occasional examination of the circulation of the toes, at the end of which time the wound-dressing and the ensheathing were removed. Union had been primary. The tumor had disappeared. At about the end of another week the patient left his bed, and during the following days, while he was under observation and walking about, no return of the circulation in the aneurism occurred.

An interesting question, and probably the most interesting one in connection with the case, comes up as to whether, in the present light, this would have been the best course of procedure, although, in this particular instance, all ended well. It is known that with the more general use of weapons of small caliber, arteriovenous aneurisms are of more frequent occurrence than formerly. And the risks of gangrene, and even death, following the ligation of the larger arteries and veins are well known. The statistics of both pre-antiseptic and antiseptic days show this. In Van Buren's report of seven cases of ligation of the external iliac or common femoral artery for arteriovenous aneurisms, gangrene followed in all. Curtis collected fifty-one cases of arteriovenous aneurism in general, treated by ligation, of which twenty-three died, eight were cured, two improved, eighteen unimproved, and gangrene occurred in eleven cases. Billroth found he had secondary hæmorrhage in 50 per cent of all large vessels ligated in continuity. Murphy reports twenty-

two ligations of the femoral artery and vein, with gangrene in twelve. He has collected 178 cases of ligation of the femoral artery alone, with gangrene in twenty-five. He also reports thirty-one ligations of the femoral artery for aneurism, with hæmorrhage in 60 per cent and death in 40 per cent. From these figures, though very imperfectly covering the field, it is clear how many lives are lost through the cutting off by ligation of the main blood supply of the parts. Recognizing, therefore the present greater frequency of arteriovenous aneurisms, and the large proportion of disastrous results following ligation of the larger vessels, it would seem wise to devise some more satisfactory method of treating this form of aneurism. The most usual and the most successful form of operative treatment of these cases resorted to until comparatively recently has been some form of ligation, either of the artery above the sac, or above and below, with or without ligation of the vein below the sac, or below and above, the best procedure generally being considered to be the ligation of the artery and vein above and below the aneurismal sac, followed, in cases of the varicose-aneurism type of arteriovenous aneurisms, by excision of the sac, or as much of it as possible.

The operation performed by the writer in the above case was done before the introduction of the Matas' epoch-making method of operating for aneurism, and the writer is not aware that the Matas method has ever been used, or suggested, in the case of arteriovenous aneurisms. If not, he would suggest the application of this more modern method of operating to this special class of aneurisms, provided the conditions present offered an opportunity to apply the principles of that operation, and thus endeavor to not only preserve the integrity of the artery and vein, but also, in consequence, to spare the patient the great risk attendant upon the loss of circulation through one or both of these vessels. It is a known fact, as mentioned above, that the nature of arteriovenous aneurism cannot always be determined clinically, and, in some cases, is only discovered when the site has been exposed by operation. But it would seem warrantable to expose the aneurism in every appropriate

case, and if the Matas operation be then found inapplicable, one of the more usual methods just mentioned could be adopted, or the original wound could be closed, and the artery ligated proximally, at some distance above, or one of the methods, other than the Matas method, to be mentioned below, might be used.

If the arteriovenous aneurism were of the varicose-aneurism type (that is, with an aneurismal sac intervening between artery and vein and communicating with both vessels by separate mouths), the writer would be inclined, where circumstances were favorable, to apply the Matas method, namely after temporarily controlling the circulation through the involved vessels, lay open the intervening aneurismal sac, locate both the arterial and venous openings into it, and close them off by fine chromic gut Lembert sutures applied interruptedly, followed by obliteration of the sac in his characteristic manner of suturing its roof, including the overlying parts, to its floor. It is to be remembered that an endothelial layer usually lines the cavity of an arteriovenous aneurism, and is especially apt to be present near the openings into the sac, although the absence of an endothelial lining would not seem to be a contraindication to the application of this method, as the surfaces of even a pure connective-tissue sac could be roughened by curettement to promote adhesions of its walls. This technic is shown in Fig. 1.

If the arteriovenous aneurism were of the aneurismal-varix type (that is, a varicosed dilatation of a vein caused by the force of the arterial circulation poured into it through a direct communication from an artery, without an intervening aneurismal sac), and the conditions were favorable for this form of operation, while the typical Matas method, owing to the absence of a sac, might not be so applicable, yet a modification of that method would seem feasible. And here the writer would suggest the following modification of the Matas technic, namely, make a longitudinal incision through the enlarged and varicosed vein for as limited an extent as would seem to afford approach to the opening into the vein, and so placed as to be directly opposite this communicating opening from the artery, retract the lips of this wound in the vein, thus

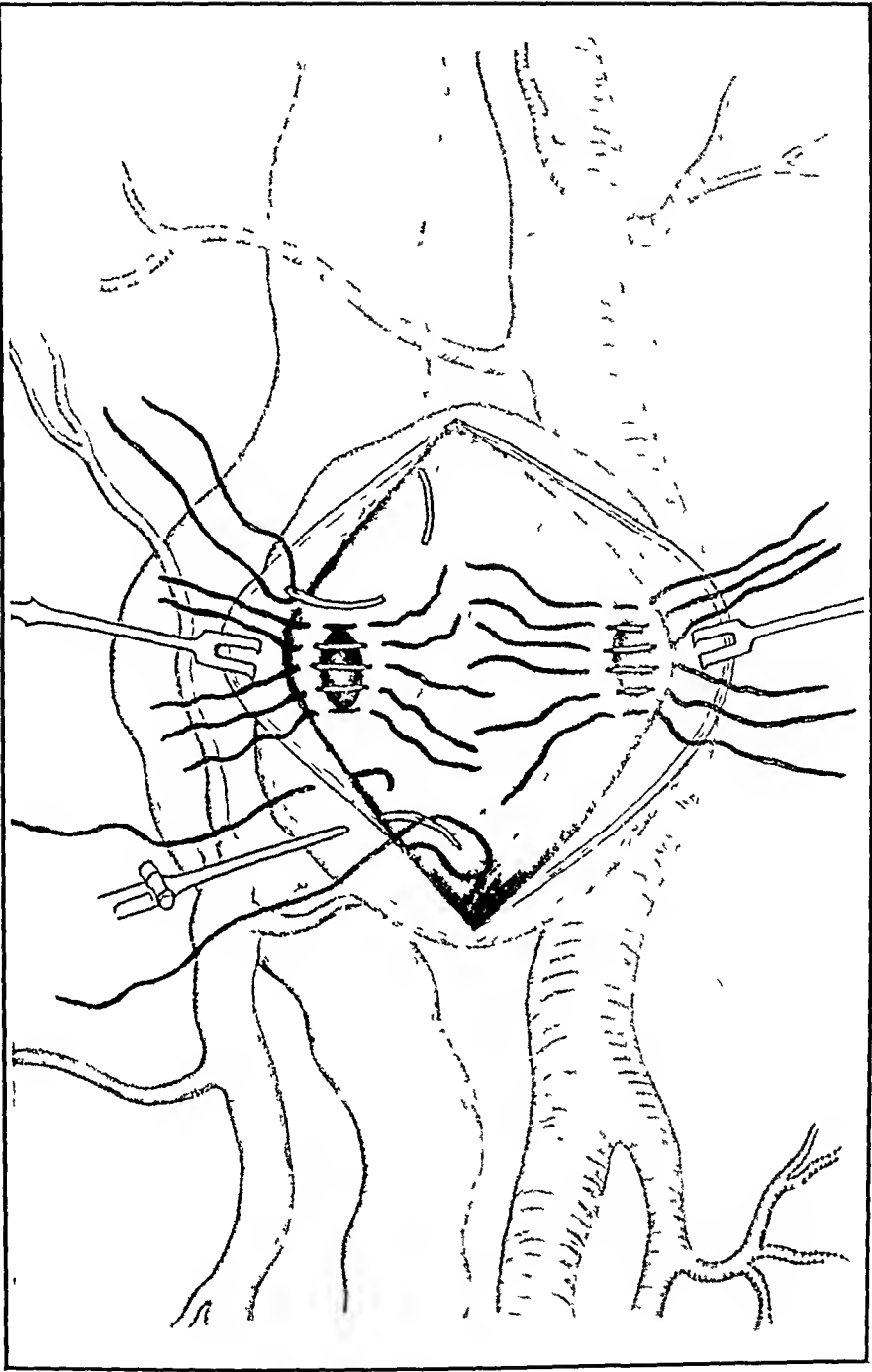


FIG 1—Varicose aneurism type of arteriovenous aneurism of left common femoral artery and vein—showing the application to this class of aneurisms of the Matas method of operating upon ordinary aneurisms. The opening of the femoral artery into the common aneurismal sac is shown on the right, with interrupted Lembert gut sutures in position ready to be tied. The opening of the femoral vein is seen on the left, with similar Lembert sutures in position. On the left of the sac two gut sutures are in the act of being placed, which, when tied, will approximate the roof of the sac (including skin and intervening tissues, which are not here shown) to the floor of the sac. Similar sutures will approximate the roof and floor of the sac upon the right.

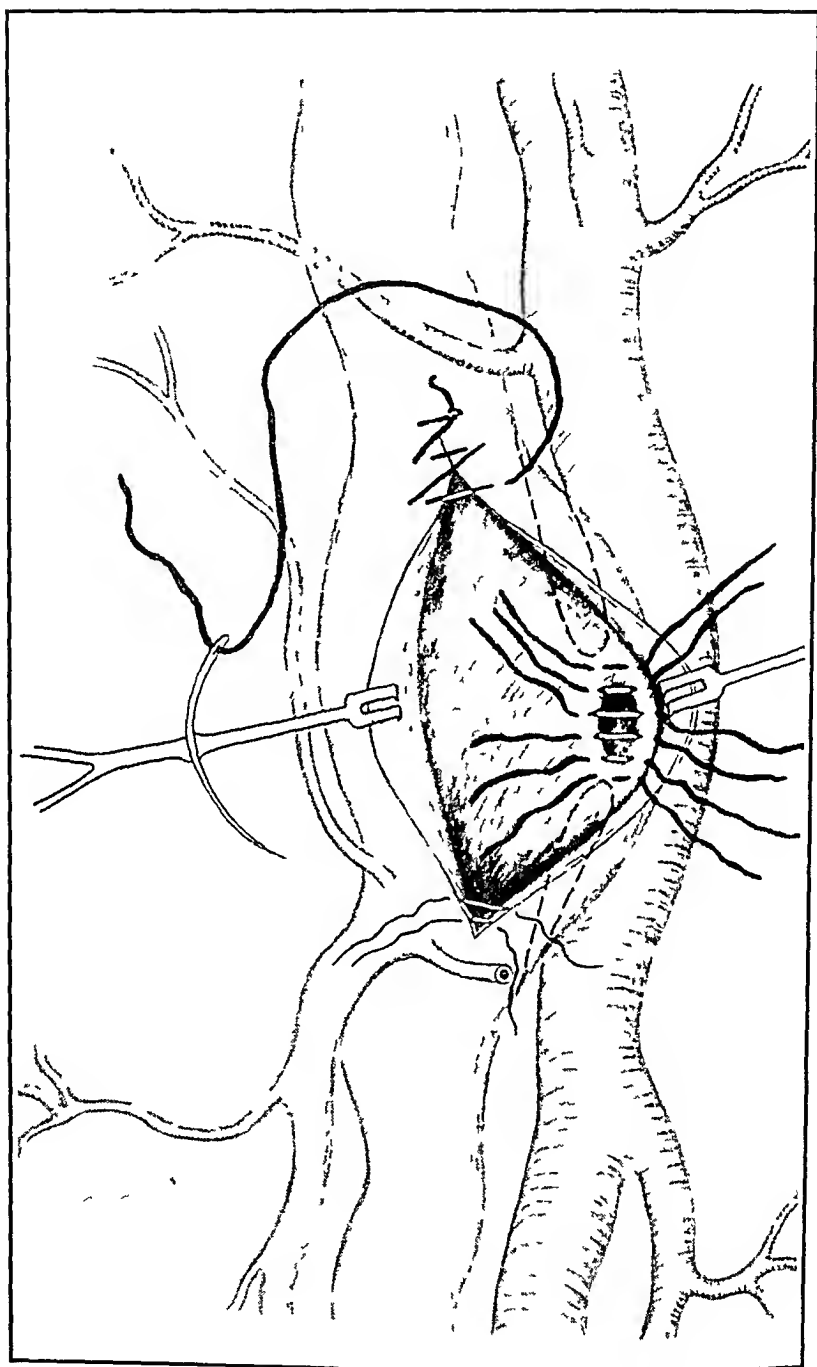


FIG 2—Aneurismal varix type of arteriovenous aneurism of left common femoral artery and vein—showing the application to this class of aneurisms of the Matas method of operating upon ordinary aneurisms. The opening of the femoral artery into the varicose vein is shown, with interrupted Lembert gut sutures in position, ready to be tied. The longitudinal incision in the vein, for approaching the arteriovenous opening (and which is here made somewhat unnecessarily long) is shown in the act of being closed by two methods of suturing—above, by the continuous Lembert of the outer coats—below, by interrupted ordinary sutures of the outer coats.

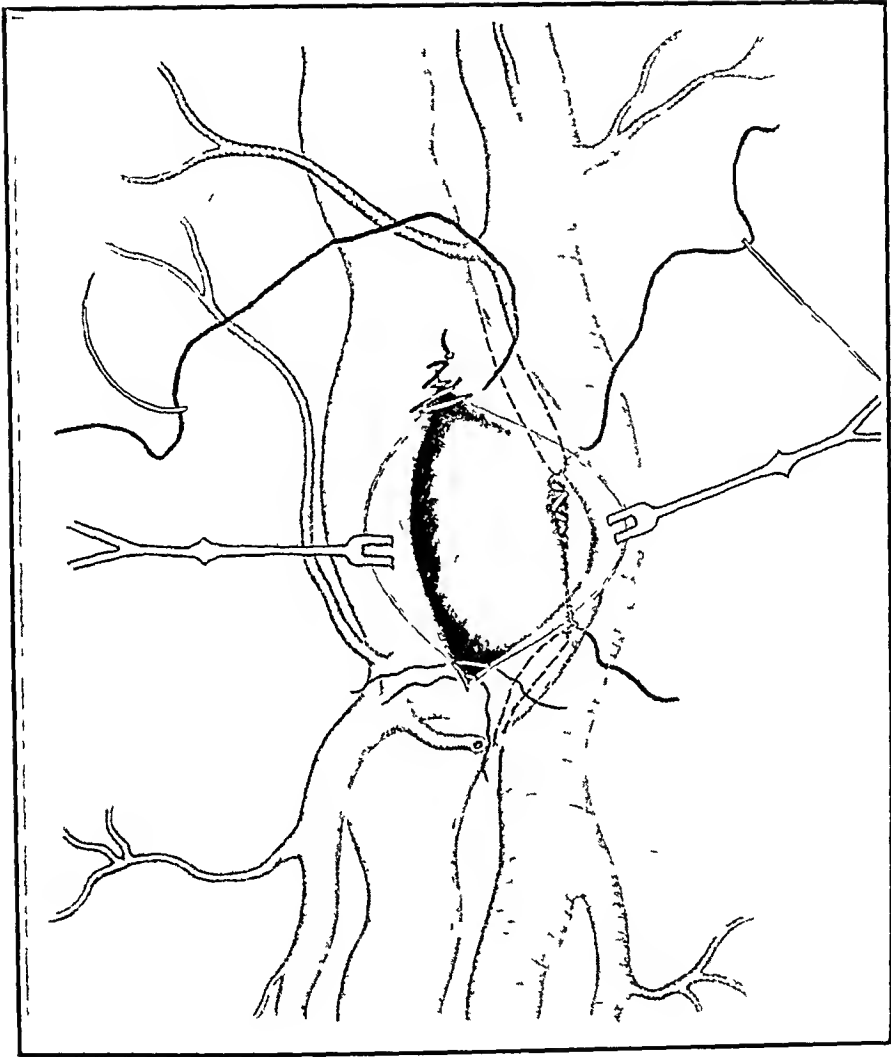


FIG 3—Same as Fig 2 showing a continuous Lembert gut suture, which, having been passed through the outer coats of the thickened vein at the angle of junction of vein and artery, and knotted, is passed on between the coats of the vein until its varicosed cavity is entered very near one end of, and immediately above, the first tier of interrupted sutures—and is then made to bury in this first tier and itself in continuous Lembert fashion—and emerging at the opposite angle of junction of vein and artery, is tied in the same manner as at its entrance (This suture is not yet tightened throughout)

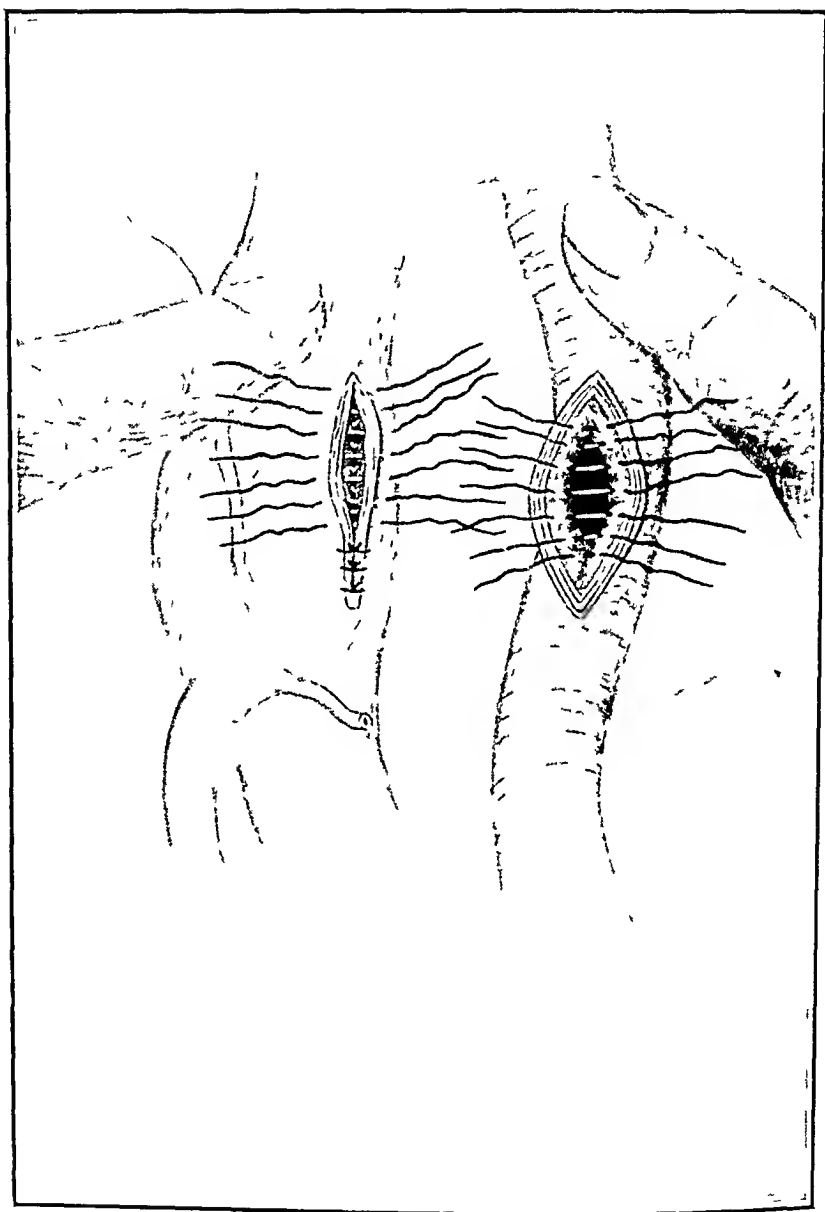


FIG 4.—Varicose aneurism of left common femoral artery and vein, treated by excision of the sac, followed by suturing of the openings in the vessels. Upon the right, a small elliptical piece of the sac is shown connected with the arterial opening, with the first tier of interrupted Lembert gut sutures in position, ready to be tied. Upon the left, a similar elliptical piece of sac has been left connected with the venous opening. The first row of Lembert sutures has been tied, and a second tier of ordinary sutures through all the coats is being applied, burying in the first tier. Fig 4 is the same as Fig 1, with the sac excised.

exposing the interior of the vein and the arterial communication, suture up the opening of the artery into the vein in the usual Matas manner, and then close the incised vein by a continuous lateral suture of, approximately, the Lembert type. Fig 2 illustrates this technic. Owing to the fact, in aneurismal-varix cases, that foreign material will be left in contact with the venous current by this manner of suturing (which does not apply in the varicose-aneurism cases), with the consequent theoretical possibility of pieces of the suture forming emboli, it would be well to use very fine gut for this suture, and to tie very small, closely-cut knots. Or it would be better still to bury-in the row of interrupted Lembert sutures closing off the arterial opening, by means of a continuous buried suture introduced from without entirely through the vein, at one of the angles of junction of artery and vein, passing in continuous Lembert fashion above the interrupted sutures, through part of the thickness of the wall of the vein, and out through the entire thickness of the vein at the opposite angle of junction of artery and vein, in very much the same manner as a subcuticular suture is passed, and so placed that the suture throughout its entire length and its points of entrance and exit, to and from the vein, are also buried, which, in the case of a thickened, varicosed vein would be easier of accomplishment than in a normal vein. This second tier of suturing is shown in Fig 3.

More recently, successful artery suturing and vein suturing have been demonstrated, and these principles have been applied to arteriovenous aneurisms. In those cases of the varicose-aneurism type where both arterial and venous circulation can be controlled proximally to the sac, and the sac exposed by dissection, the aneurismal sac may, in appropriate cases, be excised up to very near the arterial and venous openings into it, and these openings then closed by a row of interrupted Lembert gut sutures, followed by a second burying-in row through the free margins of the small portion of the sac left around the jug-like opening into the artery and vein, as shown in Fig 4. In those cases of the aneurismal-varix type, where, similarly, both the arterial and venous circulation may be arrested proximally to

the arteriovenous communication, and this site of communication be exposed by dissection, the artery and enlarged vein may, in appropriate cases, be severed from each other by an incision through the connecting opening, made parallel with artery and vein, and these openings closed by lateral ligation with fine gut or silk, the openings left by the incision of the connection between artery and vein being, in the aneurismal-varix, less jug-like and with less free margin than in the varicose aneurism. This technic is shown in Fig 5. If necessary, these openings left by the liberating incision could be trimmed into elliptical shapes.

It is also to be remembered that portions of arteries have been excised and the integrity of the vessel established by circular arteriorrhaphy. And Doiflei has demonstrated that suture material may be safely carried through all coats of arteries and veins without producing thrombosis. So that the range of dealing with vessels by methods of suturing has been very much increased in recent years.

Matas¹ himself states that he did not contemplate the application of the method which he devised for ordinary arterial aneurisms to arteriovenous aneurisms, and to circumscribed or diffuse pulsating hæmatomas of recent origin, resulting from arterial and venous wounds, leaving these types of aneurism for the methods of arteriorrhaphy and venorrhaphy. While recognizing that it is ideal to excise the aneurismal sac of a varicose aneurism and suture up the openings in the artery and vein, and to cut apart artery and vein in an aneurismal varix and somewhat similarly suture up the openings in the vessels which the severing of the common connection between them has left, leaving the circulation intact in both class of cases, yet there must occur cases in which there is difficulty of satisfactorily exposing the parts, or where there is difficulty in, and contraindication to, the removal of the sac of a varicose aneurism, or the

¹ See "An Operation for the Radical Cure of Aneurism based upon Arteriorrhaphy," by Rudolph Matas, *ANNALS OF SURGERY*, Vol XXVII, No 2, page 161.

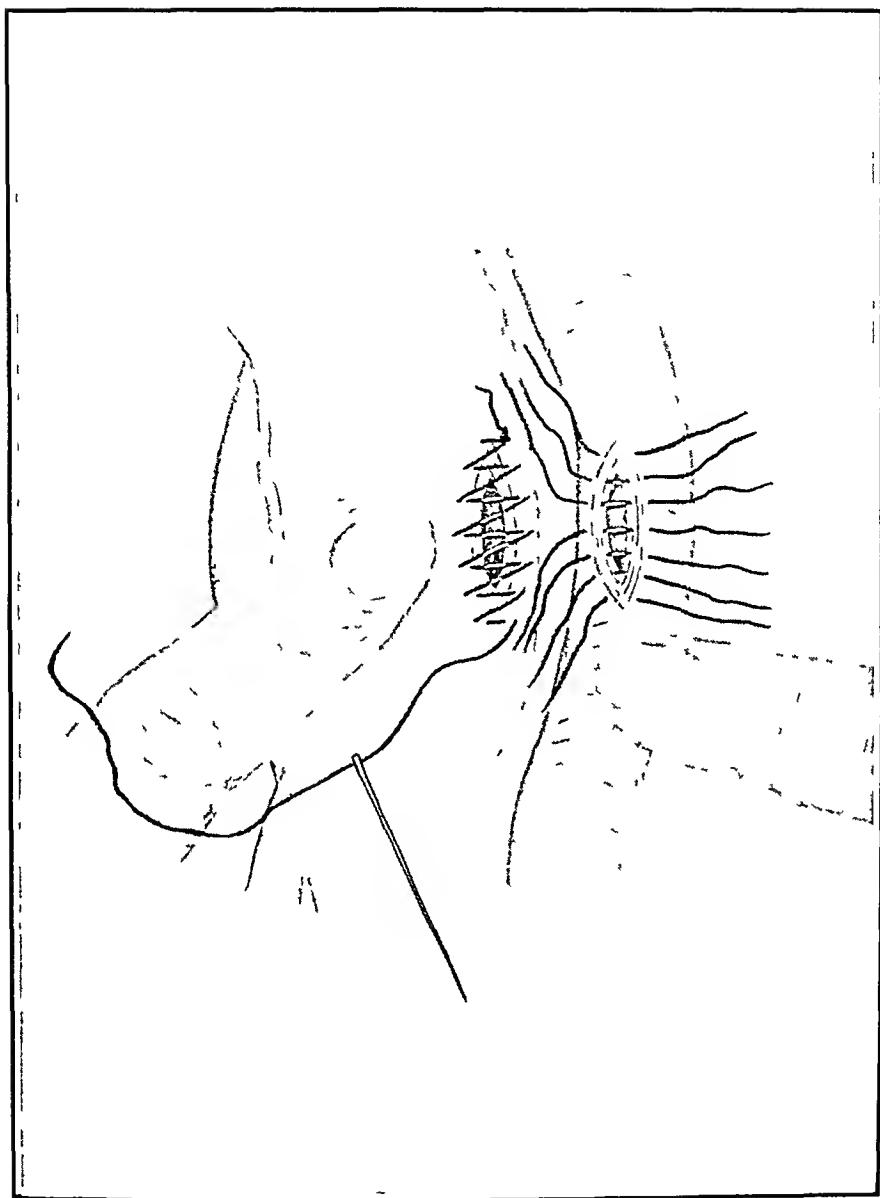


FIG 5—Aneurismal-varix of left common femoral artery and vein, treated by severance of vessels from each other, followed by suturing of their openings. On the right, interrupted gut sutures are shown passing through the outer coats of the artery, ready to be tied. On the left, a continuous Lembert gut suture through the outer coats is shown closing the venous opening. Fig 5 is the same as Fig 2, with the vessels cut apart.



cutting apart of artery and vein in an aneurismal varix, and in such cases the Matas method would seem to be a desirable technic. And while one feature is common to all of these more modern methods, and that is, the retention of the circulation through artery and vein, yet it may be questioned where, from the circumstances of the case, it is optional, whether the Matas method would not really be preferable in dealing with the varicose aneurism type of cases, for it would seem the suturing together of the roof and floor of the sac would strengthen the suturing of the arterial and venous openings into the sac and make secondary hæmorrhage less likely, and also accomplish the end with less traumatism.

SKIN-GRAFTING INFECTED AREAS

BY SIDNEY F WILCOX, M D ,

OF NEW YORK,

Professor of Clinical Surgery in the New York Medical College and Hospital
for Women

By "infected areas" I mean raw surfaces which may or may not have been originally aseptic, but which have become infected, and from which pus exudes. Such surfaces are often the result of burns, extensive operations, contused wounds, or conditions of imperfect local nutrition as in varicose ulcers.

Any of these raw surfaces, when they have become infected, may take on the form of indolent ulcers, and, in spite of every method of stimulation, the cicatricial process stops, and the ulcer may increase in size. This is especially true of varicose ulcers.

The following method of preparation of the ulcer I have found to make practicable the immediate application of Thiersch's grafts, and thereby greatly lessening the time required for effecting a cure.

The whole secret of success lies in the method of rendering the septic area *aseptic*. It is a simple one, and may be described briefly as follows.

The night before the operation, the ulcerating and surrounding area should be cleansed as thoroughly as possible with green soap and hydrogen peroxide to remove the dried crusts and débris from the granulations. In case of very foul varicose ulcers, more time may be taken, and a compress wet with 50 per cent solution of peroxide may be applied for a few days until the exudate is removed.

After cleansing, the raw surface is covered with a compress saturated with a 1 per cent solution of formaldehyde (the ordinary 40 per cent pharmaceutical preparation being the unit), and this compress is allowed to remain in place until the patient is on the operating table. When the com-

press is removed, it will be found that the granulation layer is dry and dark red in color, having an appearance much like smoked beef. This layer is about a quarter of an inch in depth, it is friable, and can easily be scraped off with a sharp spoon from the underlying tissue, which is whitish and bleeds very little. The removal of the granulation layer should be thorough, and what little oozing there is can easily be stopped by the application of the Esmarch solid rubber band for a few minutes. The use of the rubber is a valuable step in the operation, as the smooth rubber makes equable compression and does not stick to the tissues when removed, but leaves an ideal surface for skin-grafting.

The remainder of the operation is the ordinary one for the application of Thiersch's grafts. The after-treatment is the same. As a rule, at the first dressing, three or four days after the operation, the grafts are found adherent and in good order. The dressings should be done every two or three days until the healing process is complete.

I have been surprised and delighted with the success of this method in the few cases where I have tried it. Large granulating surfaces resulting from burns by molten metal, operations for the removal of the breast, and in the last case, one of a varicose ulcer the size of an adult hand, have been completely healed in a little over two weeks.

TREATMENT OF FRACTURES¹

BY GWILYM G DAVIS, M D , M R C S (ENG),
OF PHILADELPHIA,

Surgeon to the Episcopal, St Joseph's, and Orthopaedic Hospitals

SURGERY of recent years has advanced in almost all lines, but perhaps most markedly in the direction of the various internal organs. At present, surgical literature is almost monopolized by articles on operations affecting the liver, kidneys, stomach, intestines, and the abdominal viscera generally.

Operative surgery is *the* surgery of the day, and non-operative work has become somewhat ignored. Many of us will recall the days when the subjects of fractures, dislocations, etc., formed a far more important part of one's stock of surgical knowledge than they appear to do to-day. To those of us, however, who have large surgical wards under our care, the importance of fractures should especially appeal. They are as frequent now as they were formerly, and demand the same careful skill and attention if good results are to be achieved. Let us guard against the temptation to devote our attention to the operative cases and leave the fractures too much to the care of our assistants.

The extremely rapid progress of modern surgery has been largely due to our ability to maintain wounds aseptic since the introduction of Lister's method. The treatment of fractures has been influenced by this method as well as other departments of surgery, hence we find operative measures resorted to more frequently than was previously the case. The other discovery which has been of great importance in fractures is that of the Rontgen or X-rays. It has perhaps hardly met the sanguine expectations first raised, but it has proved of very decided utility.

¹ The Annual Address delivered before the Philadelphia Academy of Surgery, January 4, 1904

In addition to the introduction of the antiseptic system and the X-rays, I find but comparatively few advances, and those mainly in the treatment of the individual fractures. Hamilton and Stimson, our old standard treatises, have not been surpassed nor displaced by any more recent publications.

The old battle between the use of plaster-of-Paris and splints is still being waged as industriously as ever. Perhaps a fair comment of present methods would be to say that the profession is hardly as conversant with the dressings at its disposal as it should be.

Bandaging used to be a fine art, but since the introduction of the gauze bandage it seems to have degenerated, and is but little studied. The gauze bandage so readily adapts itself to a part as to conduce to slovenliness in its application. Nevertheless, there is a right way and a wrong way of bandaging, and the right way is still the best.

As regards the use of immovable dressings, such as plaster-of-Paris, I have never been able to content myself to place recent fractures up in plaster and allow them to remain until union is firm. I desire to assure myself by direct inspection, once or twice a week, that the fragments are in proper apposition, and any dressing not allowing this is deemed unsuitable. For this reason, for the first ten days some form of splints is always used. In some cases the tendency to deformity is lacking, and in such fixed dressings can be used as soon as the acute symptoms have subsided. If there is any tendency to deformity, the case is treated with splints until the deformity is overcome, and then the limb can be put in plaster.

It is the custom of some surgeons to correct the deformity and then immediately apply plaster, with the idea that the plaster will hold the limb in its corrected position. This is not my practice.

Should the displacement show a tendency to recur, the plaster dressing is often insufficient to overcome it. The swelling subsides and the limb shrinks, and the plaster is no longer closely applied to it. If a plaster dressing is used, it should be in conjunction with examinations by the X-rays. By them one

is able to see the relative position of the fractured bones and be assured that they are properly placed

The use of silicate of soda or soluble glass is hardly as common as it deserves to be. It makes a light, firm bandage, and is cleaner and more available than plaster. A physician in private practice can keep a pint bottle of it on hand, which is always ready for use, it does not deteriorate. In using it, it is only necessary to see that it really impregnates the bandage and is not simply smeared on its surface. In preparing a bandage for application, a quantity of the silicate may be placed in a basin and a gauze bandage passed through it and rolled with the hands, the surplus silicate is squeezed out and the bandage is ready for use.

Three or four bandages so prepared suffice for a broken leg. After its application, the hand is dipped in warm water, the bandage smoothed down, and the patient kept abed twenty-four hours, by which time the silicate will be quite hard. It can later be cut open with a stout knife and laced. If it is desired to lace it, it is my custom to have large hooks sewn to two strips of bandage. These are wet with the silicate and placed on each side of the cut. They are retained by a few turns of an ordinary bandage and will be hardened in place by the following day. These bandages can be prepared and kept ready for use covered with silicate in a wide-mouthed jar.

A strip of tin should be laid on each side of the leg and included in the bandage, and tends to prevent it wrinkling while being applied and drying. It is better to smooth the outside of the dressing with water rather than silicate, as the bandage dries quicker and harder. The use of starch is also worth remembering. Bandages are liable to slip, and starch adds to their security. Gauze bandages are preferable. On the completion of the bandage, cooked starch, such as is used in starching clothes, is rubbed into its meshes until a smooth, even surface is obtained. This dries in a few hours and holds the turns together, adds greatly to the appearance of the bandage, and increases its stiffness and security. It may often substitute the inconvenient and messy plaster-of-Paris bandage, and obviates

the necessity of using adhesive plaster, pins, etc., to prevent the turns from slipping

Let me urge a trial of this starch bandage, it will be a revelation to those unaccustomed to its use. A neatly applied fracture dressing composed of bleached gauze bandages, into the meshes of which, when the bandage is completed, starch has been rubbed, is a work of art and a thing of beauty. A word on the question of bandages may not be out of place. The old bandage of unbleached muslin has been displaced in favor of the bleached gauze bandage. To neatly and correctly apply a muslin bandage requires both knowledge and skill. I almost regret to say that a minimum quantity of both often contents the surgeon in applying the gauze bandage. The rules of procedure are hardly the same in the two instances. Reverses are not so necessary in the gauze as in the muslin bandage, but it fails to give the firm support of the muslin one. With the muslin bandage, the spiral reverse was the typical form, with the gauze, the figure 8 is the standard. This is made by using figure 8 turns, one partly overlapping the other until the part is covered. Some surgeons use very narrow gauze bandages even for large parts, as the legs, this practice I hardly think is necessary. A two-and-a-half-inch gauze bandage can be used for both extremities, which can be neatly and satisfactorily covered without using a single reverse.

The question of operation in cases of fractures is a debatable one. Now that it is possible to operate almost always without wound infection, operations are justifiable when previously they were not to be thought of. The question of personal equation in the surgeon here becomes prominent. For an operation to be successful, the problems presented by the individual case must not only be skilfully handled, but the procedures must be carried out in such a manner as to insure prompt healing without suppuration.

This means that the technique employed by the surgeon must be efficient. To develop such a technique as will stand the test of the widely differing individual cases without failure necessitates both labor and experience on the part of the sur-

geon Practice makes perfect It is undoubtedly easier to carry out a rigid asepticism in a hospital operating room than it is in the home of the patient, where proper facilities are frequently lacking For these reasons operations may be performed advisably by the experienced surgeon operating in a hospital that would be inadvisable in a private house by one who operates only occasionally

The recommending of an operation entails certain definite responsibilities, and we should be prepared to meet them

Before leaving the question of operation, I might state my belief that we do not operate on simple fractures with unbroken skin with sufficient frequency Among such are fractures of the neck of the femur in people under fifty-five years, fractures of the upper third of the femur and some of other portions, fractures of the patella and olecranon with wide separation In some fractures of the leg division of the tendo-Achillis is very useful In bad fractures of the clavicle wiring is not a dangerous procedure In elbow fractures, in which ankylosis is unavoidable, a resection will give a movable joint and much better result

The question of operating is linked with that of failure of proper union This is due in the larger number of cases to wide displacement of the fragments with the interposition of muscular or fibrous tissues Hence an inability to sufficiently reduce the fragments is an indication to operate It is not an uncommon fault for fractures to be treated conservatively which should have been operated on primarily Many of the deformities seen to follow fractures are not only unsightly, but often seriously impair or even destroy the usefulness of the member and predispose it, as I have seen in several cases, to re-fracture Modern surgery demands better results than were satisfactory in the past It used to be the custom to practically treat all fractures conservatively and accept the results with proper resignation This is no longer permissible If we cannot place the fragments in such a position as to insure a satisfactory result, it is our duty, if the circumstances permit, to do so by operative means Not only does non-union result from mis-

placed fragments, but likewise excessive callus. The paralyses and interference with the function of nerves, which not infrequently follow fractures, are often attributed to the nerve being included in and being compressed by the callus. While not prepared to deny that this may sometimes be the case, it is my belief that these nerve lesions are almost always due either to a direct injury of the nerve, usually by the fragments, at the time of fracture, or else to consecutive changes induced in the nerve by its being stretched over the sharp edge of a displaced fragment. This I have verified on several occasions. It is evident that if a nerve is stretched over the sharp edge of a fractured surface, when the callus forms it will of necessity include the nerve. For this reason it by no means follows that, because a nerve is found enclosed in callus, the callus is the cause of the symptoms rather than the injury sustained by being stretched over the sharp edge of bone. These nerve injuries are sometimes attributed to callus because their presence is so often only discovered after the removal of all apparatus and the use of the limb is attempted. It is extremely disconcerting to find, at what one has expected to be the conclusion of treatment, the unexpected appearance of this complication. It is most liable to escape recognition if fixed dressings have been employed early in the treatment of the case. This is one of the reasons that disinclines me to use plaster-of-Paris early in fractures.

In some fractures the immediate results are so disturbing as to prevent one for some days, and even longer, from ascertaining the full extent of the injuries. It is in these cases that it is particularly desirable to so dress our cases as to enable them to be examined at sufficiently frequent intervals. In some cases even a daily inspection for the first week and twice a week thereafter is not too frequent. Too often the pains of a neuritis are attributed to the broken bones and torn muscles and ligaments, and paralyses are allowed to exist unrecognized until firm union has occurred and use of the member is attempted. The formation of callus presents some interesting features. It is, I believe, due almost solely to the displacement of bone. In other words, the formation of callus is evidence that accurate approximation

has not been achieved I had a case a few years ago which demonstrated this quite clearly

A man had sustained a fracture of the upper third of the thigh with the customary anterior and outward displacement of the upper fragment to an unusual degree Operation revealed a spiral fracture about two and a half inches long running upward, backward, and inward

Traction being made by an assistant, the two fragments were fitted accurately one to the other and fixed firmly in place by two thick silver wires encircling the bone an inch and a half apart

At the end of the seventh week an incision was made and the wires were removed Union was found to be firm and the site of fracture was seen winding round the bone as a thin dark line There was absolutely no thickening nor the slightest indication of any provisional or ensheathing callus It is evident that in this case the callus which united the broken ends was between the bone surfaces and in the medullary cavity, because there was none external

The exact approximation of the fragments in fractures of the base of the skull is the reason why callus is also lacking there

The presence or absence of callus has a marked influence on the functional results obtained, especially in fractures in the vicinity of joints If, as has been stated, callus is due to lack of proper approximation of the fragments, it is evident that if a joint is involved and the fragments are not approximated, we must expect limitation of motion Limitation of motion due to this cause is almost insurmountable The use of passive motion is usually of no avail, and healing progresses either with a resultant ankylosis or restricted motion Repeatedly have I seen persistent passive motion practised much to the distress of the patient, with but little or no benefit resulting It is in these cases that the X-ray is of service Fractures which involve the joints not infrequently detach pieces of bone, which become more or less twisted out of their normal position, and later be-

come fixed, thus interfering with the motion of the joint. It is not a hopeful practice to endeavor to retain motion by passive movements calculated to push the fragments away, they cannot be displaced far enough to prevent their influencing the joint movements. The condition of affairs having been recognized by the X-ray, it is better to follow the advice of Roberts and others and pin the fragment in place, or deliberately cut down and replace it as it should be, retaining it with wire or other suture material, or even resect the joint.

The recognition of the uselessness of passive motion in overcoming limitation of movements in joints has caused some surgeons to advocate the treatment of fractures of the elbow without it until the splints have been removed and union has occurred.

If the fragments are in good approximation and the joint is kept quiet, the inflammatory effusion and callus is kept at its minimum, and the joint soon limbers up when restraint is once removed. Restoration of function can be hastened by baking the limb. The use of hot air, while serviceable in cases of fracture of healthy limbs, is deleterious in tubercular affections, hence in old cases the possibility of tubercular disease should be carefully excluded.

The question of passive motion is allied to that of massage.

I regret to say that, in spite of the attention of the profession having been directed to the use of massage in fractures many years ago, it still is not employed as much as it should be. This may be due partly to a distrust aroused by the extensive claims of some of its most ardent advocates, as Lucas Championnière and others.

Personally, while occupying a middle ground, the stand I take is none the less a positive one. I cannot follow those who treat fractures from the first by massage only without support. To my mind, the first principle in the treatment of fractures is that the two broken ends of the bone should be placed and held in as close approximation as possible. That this can be accomplished better with than without splints is at least my opinion. Even the ordinary movements of the body tend to disturb the

fragments, and unusual movements, such as one is constantly experiencing, disturb them still more. The fact that fractures, such as those of the patella, radius, etc., frequently unite with little or no support or protection, is no proof that they should not have been afforded both. There are few cases, indeed, where a fracture would not be benefited by a proper support skilfully applied. It need not always be elaborate, a fractured leg is sometimes best treated and most comfortable if allowed to rest for a day or two folded in a pillow. The use of splints is not incompatible with massage. As regards the time of its use, in many cases it can be commenced at once as soon as the fracture is seen. A light stroking "effleurage" of a recently injured limb need not cause pain, but rather be grateful to the patient, and tends to restore the circulation and promote the absorption of effusion. Its efficacy depends on the manner of its administration, anything approaching roughness is obviously unsuitable in cases of recent injury, and if real pain is experienced it is evidence that the massage is either unskilfully administered or that it is unsuitable to that case, and most likely the former.

It is true that there are some cases in which the local injury is so great in simple fractures that the treatment should be of the simplest character, such as the use of evaporating lotions, cases in which there is much bruising of the skin may be of this character. After the first reaction has passed, say in a couple of days, there is no longer any excuse for delaying massage. I regret to say that it is still too much the custom to use fixed dressings, which are allowed to remain on the part without removal for several weeks. This may promote the healing of the bones, but it does not tend to restore the soft parts to their normal functions. The worst effects of this treatment are seen in fractures of the leg. When the upper extremity is fractured, the patient rarely requires to be admitted to the hospital, but a fracture of the lower extremity interferes with locomotion, and consequently it is admitted for treatment in the wards. In order to make room for new patients, the temptation is great to put fractures of the leg up in plaster-of-Paris dressings and

allow the patient to leave the hospital on crutches. When, after the lapse of several weeks, the plaster dressing is removed at the out-patient department, it is usually found that, while the bones themselves have united firmly in a fairly satisfactory position, the leg and foot are swollen, cedematous, and stiff. The slightest attempt at movement causes pain. If now the case is left off and the patient allowed to go around, it is often weeks or even months before the muscles, tendons, ligaments, and soft tissues generally have become loosened sufficiently and restored to their normal condition to allow of painless locomotion. This is needless. Suppose the patient had remained in the hospital and been treated with the old-fashioned fracture-box, and that each morning the sides of the box had been lowered and the soft parts gently massaged and, as healing progressed, the joints gently moved, we would then by the time that union had taken place have restored the normal condition of the soft parts and the leg would be ready and in fit condition to resume its functions. It is *prima facie* evidence of inefficient treatment when one is compelled to institute an elaborate further course of treatment to overcome effusion and stiffness after complete union of the bone has taken place. The frequency of the massage depends on the individual case. In some twice a week will suffice, but in others daily massage is necessary. It is true that to give fractures this amount of attention will consume much time. This is so, but it is the only proper way to treat fractures, and when not carried out results in delayed convalescence and deprivation of the use of the injured member.

Limitation of movement may be the result either of displaced fragments, as already alluded to, or to inflammation and effusion in the soft parts. It is to this latter condition that massage is particularly applicable.

The primary treatment given to fractures varies with different surgeons. Many have wet applications applied, lead water and laudanum is a great favorite. Their importance seems to me to be overrated. Some have a habit of applying lead water to every case, and covering it with oiled silk or other impervious material.

This can hardly be necessary. Routine treatment is, and of necessity must be in many cases, bad treatment. Individual cases vary.

One frequently encounters cases in which there is little or no displacement, and which undisturbed give the patient no pain. What object is to be gained by wet applications in such cases is hard to see. They can be rendered perfectly comfortable by applying a nicely adapted and padded splint with gentle compression by a neatly applied bandage. Using a thin layer of cotton over the part under the bandage will be more acceptable than a moist dressing.

The use of wet dressings I am inclined to believe favors the formation of blebs by macerating the skin, and on that account are objectionable. In some cases, where redness and pain are prominent, some soothing application is of advantage, and here occasionally some form of wet dressing is desirable, and seems to add to the comfort of the patient and to aid in allaying the inflammation.

A favorite application is lint or gauze moistened with equal parts of glycerin and water. If the leg is the part involved, as is usually the case, the dressing is simply laid on its surface, and perhaps a light ice-cap added. In many cases a plain towel laid on the limb with the ice-cap is all that is necessary. No impervious covering is to be used.

The question of the extent to which it is desirable to use ambulatory dressings occupied the attention of the profession some years ago to a greater extent than it does at present. That it is possible to treat fractures even of the thigh with a certain degree of success without confining the patient to bed has been amply demonstrated, but the method, even as applied to fractures of the leg, has not been found desirable. It is possible to do many things which it is inexpedient to do, and this is one of them. In stating this, I do not mean to say that ambulatory dressings are never to be used. On the contrary, the surgeon should be familiar with the method, so that when proper cases present themselves it may be utilized.

The method is only intended for use in fractures of the

lower extremity, and one of the objections to it is the swelling and pain which arise when a recently fractured limb is placed for any length of time in the upright position. In fractures of the leg, when there is but little tendency to displacement, patients can, not infrequently, be induced to go around early in a fixed dressing and crutches.

I have made quite extensive use of silicate of soda or plaster dressings in which is incorporated a piece of strap iron which passes down one side of the leg and up on the other, being allowed to project about three inches beyond the sole. With a high shoe on the opposite foot and crutches the patient can go around with a considerable degree of safety. To make an efficient ambulatory apparatus that can be removed for purposes of massage entails considerable trouble, and the temptation is to allow the dressing to remain intact until consolidation of the bones is completed. For these and other reasons the method is only to be used in those cases in which it is impossible to retain the patient in the wards of the hospital, or where for special considerations one is willing to devote an unusual amount of time and trouble in order to obtain certain desirable objects.

When the thigh is the bone involved, if the fracture involves the shaft or upper extremity, the method is practically undesirable.

In fractures low down near the condyles, particularly in children, some form of orthopædic appliance, such as the hip splint of Thomas or Taylor, can be successfully used, but children are usually not pressed for time, and adults commonly prefer the comforts of a bed to the discomforts of a splint and crutches. Nevertheless, it is our duty to know what can be done to enable patients to get around early, and, if the necessity for an employment of the method arises, we should be able to give our patients the benefit of the treatment.

A NEW OSTEOPLASTIC AMPUTATION AT THE ANKLE-JOINT¹

BY ALEXIS V MOSCHCOWITZ, M D

OF NEW YORK,

Adjunct Attending Surgeon to the Mount Sinai Hospital (From the First Surgical Division, Mount Sinai Hospital, Arpad G Gerster M D, Attending Surgeon)

At the very outset I would state that in the following remarks I shall not discuss those amputations in which a portion of the os calcis or astragalus can be preserved. No one who has had any experience with the Pirogoff amputation, or with any one of its numerous modifications, will or can deny that the ultimate results are simply ideal, and to my mind, at least, there can be no discussion nor improvement when an amputation of this nature can be performed. This operation, therefore, should be the operation of choice in all those cases in which the disease, or trauma for which the amputation is performed, lies distally to the tibiotarsal articulation, provided always, of course, that the os calcis is healthy, and that there is sufficient integument to cover the stump. There occur, however, a number of cases in which the provisions above stated do not exist, and recourse must be had either to an amputation higher up on the leg, or, in a few rarer instances, to the so-called Syme's amputation. It is particularly of this latter class that I wish to speak, as I believe I have devised a method which, while preserving all the good qualities of the Syme method, excludes all of its drawbacks and disadvantages.

At this place I shall not dilate upon the good qualities of the Syme stump, as they are well known to everybody, but its one disadvantage must be emphasized. Personally, I am absolutely convinced that, as far as function is concerned, a stump formed according to the method usually given for a Syme's

¹ Read before the Surgical Section of the New York Academy of Medicine, March 4, 1904

amputation must *eo ipso* be bad, because the distal extremity of the stump is formed by bone sawn transversely across. I am fully aware of the fact that I should hesitate to express myself so forcibly about a well-recognized and universally adopted method, but I have reason to believe that this drawback of the operation is not sufficiently appreciated.

In an article which appeared in the *Medical News* of February 9, 1901, and in which I referred particularly to the valuable studies of Bier, I have already stated fully the reasons of faulty stumps, and, just to recapitulate briefly, I would say, that an amputation stump can be good only if the distal extremity is covered, either by normal cartilage, as, for instance, in an exarticulation, or if the sawn surface is covered or sealed by normal bone, covered by normal periosteum, taken either from the bone amputated or from an adjoining bone. I believe this to be the fundamental principle and the *sine qua non* in the formation of all amputation stumps, and, provided, there were no contraindications, I have always been guided by this principle when performing an amputation on any part of the body. Everything else, as the shape of the stump, the form of the incision, the size of the stump, the skin or muscle covering the stump, is secondary, and must give way to the first requirement, provided it can be our aim at all to form a good, end-bearing stump. Let us now investigate an ordinary Syme stump, and see whether it will correspond to the above requirements, and if what I have said is true, then I trust you will also very readily agree with me that my remarks regarding the poor quality of the Syme stump are not too forcible.

In the original Syme's amputation both malleoli are sawed off, as well as a thin lamella of the tibia, in other words, a sawn surface is exposed everywhere. It is true that both Syme and, since his time, others have modified the operation in so far that they have left in place the cartilage-covered surface of the distal extremity of the tibia, and have sawed off the malleoli only, while from my stand-point the original operation was bad in all respects, the later modification was anatomically only half as bad, as it exposed a sawn surface only on two sides, but

functionally it was just as bad as the original amputation, because it could never form a good, end-bearing stump

It is only lately that I discussed this point with a very skilful manufacturer of artificial protheses, and, contrary to my firm assestion, he insisted upon the superior qualities of the Syme stump, and offered to prove his statements by at least one end-bearing Syme stump Subsequently, he gave me an op-

FIG 1

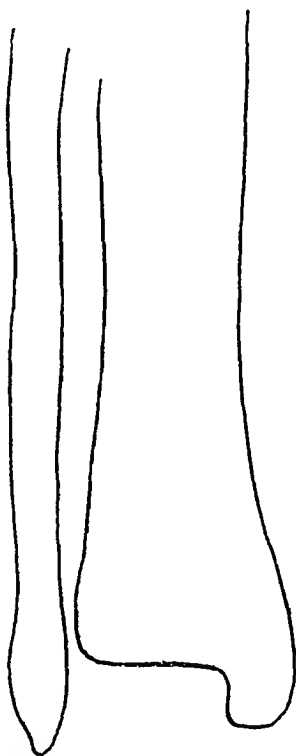


Diagram of tibia and fibula after exarticulation of the foot

portunity to examine this stump, and on investigation, it is true, I found an end-bearing stump, which, however, proved to be not a Syme but a Pirogoff I am also compelled to exclude those occasionally seen stumps, which are formed by a true exarticulation of the foot, without interfering in any way with the malleoli, these, as I have pointed out, must be, like all ex-articulations, perfect stumps, but this method of operation is only rarely indicated, and is not a Syme's amputation

The question, therefore, was how to amputate the foot at the ankle-joint, and yet leave nowhere the sawn surface of any bone. I have solved the question in the following manner.

The cutaneous incision is made in such manner and such place that we can obtain ample, healthy skin for covering the stump, if there is any choice, it is preferable, of course, to carry the incision in such a manner that the resulting cicatrix

FIG. 2

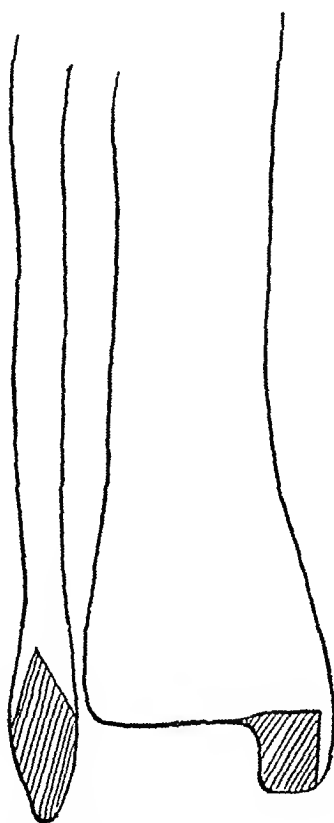


Diagram showing portions of bone to be excised

will not come to lie directly on the end of the stump, and of these two preferably anteriorly, because then the integument covering the stump will be formed out of the thick heavy skin forming the heel, but on no account should the length of the stump be sacrificed for the heel-flap.

After retraction of the skin there follows a rapid exarticulation of the foot at the ankle-joint, this exposes the two

malleoli and the contiguous portion of the tibia covered by its cartilage

An irregular octohedria-shaped piece of bone is now sawn out of the fibula in the following manner. The saw enters the fibula on the inner side, approximately on the level of the cartilage covering the tibia, and is carried obliquely upward and outward for a distance of about one and one-half centimetres to within one or two millimetres of the external surface of the

FIG 3

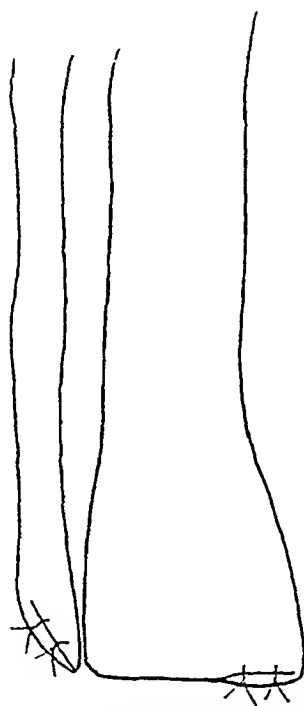


Diagram of stump after suturing the two osteoperiosteal flaps

fibula, the saw is now withdrawn and made to enter the external surface of the fibula, also at the level of the cartilage covering the tibia, and is then carried mainly upward, but with a slight deviation inward, until it meets the end of the first saw-cut, thereby preparing a small osteoperiosteal flap from the outer surface of the fibula, which can be readily fractured and deflected temporarily outward. The portion of bone removed has the shape of an irregular octohedron, one apex of this is at

the tip of the malleolus, the other one is at the junction of the two sawn surfaces, while the two lateral borders are on the external and internal surfaces of the fibula, on a level with the cartilage covering the tibia. The two sawn surfaces are now approximated and fastened by catgut sutures, which pass through the periosteum covering the parts. (See diagram.)

We now turn our attention to the tibia. As is well known, the internal malleolus is shorter and thicker, the procedure has to be varied somewhat therefore. The saw enters the inferior surface of the malleolus about two millimetres from its internal surface, and is carried in an upward direction up to the level of the cartilage covering the tibia, this forms a small osteoperiosteal flap from the inner surface of the malleolus, which is temporarily deflected inward. The remaining portion of the malleolus is now removed with a saw, also on a level with the cartilaginous surface. The two sawn surfaces are now approximated and held in place by means of catgut sutures, which pass through the periosteum covering the parts. (See diagrams.)

Let me emphasize by stating once more that the good qualities of a stump depend entirely and absolutely only upon the bone, and in order to have these qualities, the end of the bone must be covered either by its normal cartilage, or by bone covered by its normal periosteum. Let us now look at the composition of the stump made by the method outlined above, if properly made, we will find a broad stump divisible into three surfaces, viz., a small inner one, and a smaller outer one, covered by normal bone and periosteum, and a larger central one, covered by normal cartilage, all in all, we find all the requirements present for the formation of a perfect, end-bearing stump.

The final step consists of accurate hæmostasis, followed by suturing of the skin, after the introduction of suitable drainage, if indicated.

The feasibility of this operation occurred to me some five years ago, when I first began to perform amputations by osteoplastic methods, but not until the past year did a suitable case

offer itself for a trial. Following is a brief extract from the history of the case.

J. K., a miner by occupation, and twenty-three years of age, injured his left foot on February 28, 1903, by a block of coal falling upon it, the injury crushed the tarsus and metatarsus, and the subsequent sloughing caused an extensive loss of the integument and subcutaneous tissues, involving both the dorsum and planta pedis, from near the ankle-joint almost to the toes. He was admitted to Mount Sinai Hospital on September 27, 1903, at which time the following condition was found. The left foot was in a position of pes equinus. The integument of most of the dorsal and plantar surfaces of the foot was destroyed and replaced by a mass of scar tissue, densely adherent to all the underlying bones, a large irregular ulcer occupied the heel and lateral portions of the foot. With this local condition an amputation was the only remedy, and its performance was relegated to me by Dr. Arpad G. Gerster, in whose service the case was.

Operation, October 2, 1903. The incision was absolutely irregular in outline, owing to the encroachment of the ulcerated surface into the seat of the operation. In other respects the operation was performed exactly according to the method outlined above. Primary union resulted, with the exception of a small sinus, which continued to secrete for a long time an aseptic synovial fluid. This persisted for so long a time that on December 7 the sinus was enlarged, and the synovial membrane covering the cartilage was scarified and some of the lateral margins curetted. The ultimate closure of the wound was therefore protracted, but finally patient was discharged perfectly cured on January 17, 1904.

Accompanying skiagraph (Fig. 4), taken five weeks after operation, shows firm union of the two osteoperiosteal flaps. The stump resulting from the operation was perfect in all respects, the patient could walk upon it on the bare floor without the least protection, and no amount of pressure could elicit the slightest pain in it. He now wears a prothesis which is only about two inches higher than an ordinary shoe, walks only with an indication of lameness, and has returned to his rather arduous work as a miner.

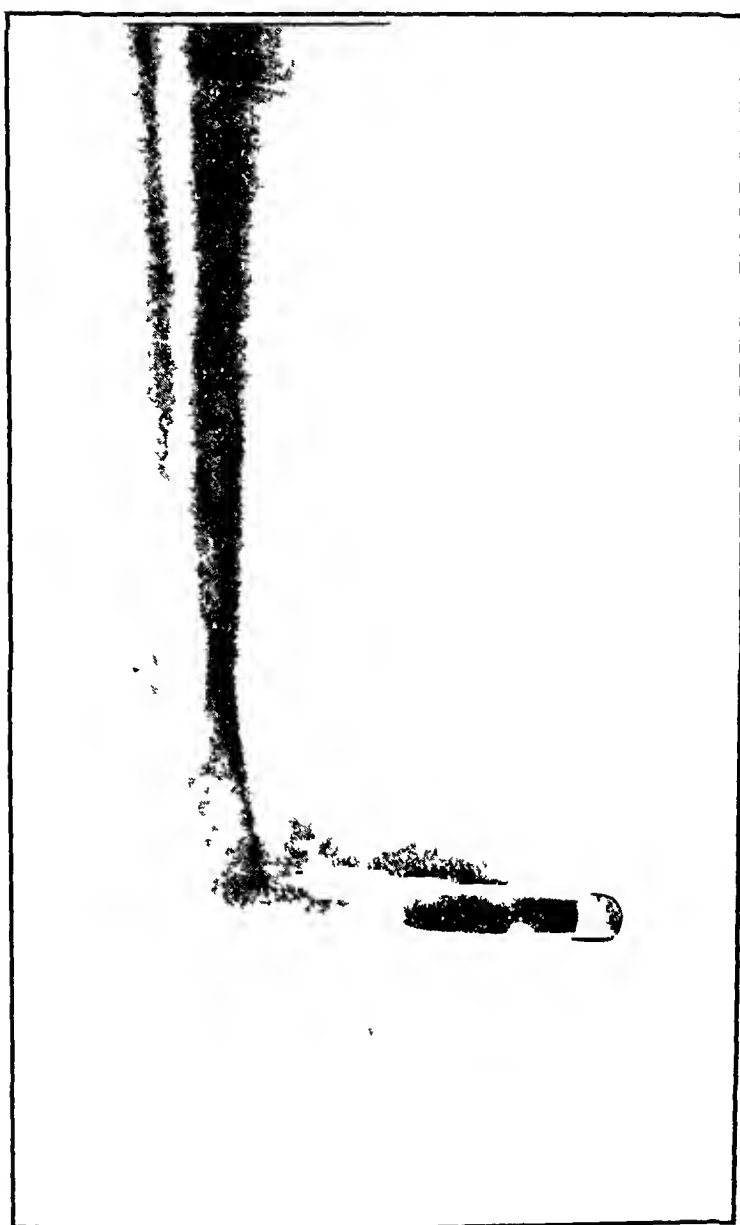


FIG 4 —Skiagraph of stump

It might, and with propriety, be argued that I assume great privileges to recommend an operation which I have personally tested but once, in reply to this I can only say that in the case tried the ultimate result, as far as function, etc., is concerned, was absolutely perfect in all details, and that for theoretical, but nevertheless fully tried reasons in other amputations, this modification of amputations at the ankle-joint is and must be perfect

SOME OBSERVATIONS ON THE EFFECTS PRODUCED ON THE SKIN BY THE DISCHARGE OF SMALL-ARMS LOADED WITH SMOKELESS POWDER ¹

BY ALEXANDER B JOHNSON, M D ,

OF NEW YORK,

Surgeon to the New York Hospital

THE effects upon the skin produced by the discharge of small-arms loaded with black gunpowder at close range have often been studied

The subject is of especial interest from a medicolegal point of view Not all the grains of black powder in the charge are burned in the barrel of the weapon, and the unburned grains or partly burned grains are propelled with some force for a distance of several feet

If these strike the human skin or the clothing certain effects will be produced, which will vary according to the weapon used, the size of the powder charge, and the distance of the muzzle from the skin or the clothing, as the case may be

With a given weapon and a given charge of powder, it may be possible to determine from the character of these effects whether a shot has been fired within a certain distance or not The important bearing of such data upon the judicial verdict in certain cases of murder or suicide is obvious, and evidence so derived has in many instances been of great use in the furtherance of justice

The effects produced by black powder upon the skin are in the nature of tattoo marks, that is to say, the grains of powder are driven into the substance of the skin The area thus marked increases with the distance at which the shot was fired,

¹ Read before the New York Surgical Society, January 27, 1904

whereas the number of grains embedded diminishes with the distance. Such tattooing may, it is said, occur at a distance of at least ten feet.

The hair of the scalp may be singed at a distance of three feet by the discharge of an ordinary .32-caliber revolver.

Clothing may be scorched by the discharge at a distance of several feet, and at a range of a foot or less linen may be set on fire.

The effects of black powder, then, are obvious and, within certain limits, fairly definite.

It occurred to me that some experiments to determine whether other or similar effects were produced by the discharge of pistols loaded with smokeless powder might not be devoid of interest.

There are at present several kinds of pistols on the market using smokeless ammunition exclusively. It seems therefore not improbable that in the future homicides and suicides will largely be committed with weapons using ammunition of this class.

Smokeless powders have gun-cotton as a basis, to which is sometimes added a small amount of nitroglycerin, or one or more of a large number of ingredients both organic and inorganic. The purpose of these additions is to modify the character of the ignition or of the explosion, or to give the powder a distinctive color or to make it waterproof. The grains of such powders are usually small and of various shapes.

The explosion of black powder gives on the average 65 per cent solid residue and 35 per cent of usable gases. Smokeless powders give on the other hand nearly 70 per cent of usable gases and 30 per cent of solid residue.

Smokeless powder is at least twice the strength of black powder weight for weight, some kinds are much stronger. Accordingly, the amount of residue of smokeless powder driven from the gun is much less than is the case with black. The combustion of smokeless powders is, in other words, much more complete.

The circumstances under which my experiments were con-

ducted led me to omit, for prudential reasons, the use of high-powered rifles, and to use only pistols and a shotgun. Through the kindness of Dr J C Ayer, I was able to experiment with four pistols,—Colt's automatic pistol, caliber 32, Colt's automatic pistol, caliber 38, the Luger automatic pistol, caliber 7.65 millimeters, the Mauser repeating pistol, caliber 7.63 millimeters. These latter two are of German manufacture.

For comparison, a black powder 32-caliber Hopkins and Allen revolver was used, firing Smith and Wesson ammunition.

The shotgun used was a 12-gauge Parker gun, what is known as a close shooting-gun.

For the purpose of testing the effects of the discharges upon the skin, the body of a medium-sized man was procured. The cadaver was quite recent, the skin showed no signs of decomposition, the muscles felt quite firm. Rigor mortis was absent.

In addition to notes on the effect produced upon the skin, some observations were made on the penetration of the different pistols. Lastly, a number of shots were fired from a shotgun to determine the character of the wounds produced at different ranges.

SHOT 1—Colt's automatic pistol, caliber, 32 inch, smokeless powder, charge, four grains Walsrode powder, bullet, lead, full copper mantle, weight, seventy-six grains. Distance of muzzle of pistol from skin two inches. Shot fired at the side of the head in front of the ear, skin covered with short hair. The hair was not singed. The skin was not burned. A few grains of a dark gray residue were found upon the hair and upon the skin over an area one inch in diameter surrounding the bullet wound. These grains were readily wiped off with a dry cloth, leaving no visible mark behind.

The wound of entrance in the scalp was a small, circular orifice one-sixteenth of an inch in diameter. There was no discoloration of the edges apparent, nor were the edges frayed.

The wound at the point of entrance in the skull was found to be a round hole through the bone about the diameter of the bullet.

The wound of exit from the scalp upon the opposite side of the head back of the ear was a mere slit in the skin one-fourth of an inch in length.

The wound of exit from the skull was a round hole about the diameter of the bullet. The bullet failed to penetrate the barrel of sand used as a backing, and was picked up off the floor but slightly deformed.



FIG 1—Three shots From before backward 32, black powder 38 Colt,
smokeless 32 Colt smokeless

SHOT 2—Colt's automatic pistol, 38-caliber, soft-nosed copper jacketed leaden bullet, smokeless powder (seven grains Walsrode²), bullet 130 grains. Was fired into temporal region of the skull at a distance of two inches. Wound of entrance a round orifice in the skin one-eighth of an inch in diameter. Edges of wound slightly contused. A few faint lead-colored stains upon the skin surrounding the wound. These specks appear to be embedded in the skin, and cannot be removed by rubbing with a wet cloth. The hole of entrance through the skull is round and about the diameter of the bullet.

The wound of exit in the skin upon the opposite side of the head is an irregular tear about one inch in length, with radiating slits along its border. Brain substance escaped freely from this orifice as well as from the external auditory canal on the same side of the head. Palpation of the skull showed a comminuted fracture surrounding the wound of exit. The comminution of the skull extended over an area three inches in diameter in the temporal and parietal regions. There was doubtless also present an extensive fracture of the base of the skull. After leaving the head, the bullet buried itself in a barrel of sand.

SHOT 3—For purposes of comparison, a shot was now fired from a Hopkins and Allen revolver, caliber, 32 inch, Smith and Wesson ammunition, black powder, ten grains, soft lead bullet. The shot was fired into the temporal region with the muzzle of the pistol three inches from the scalp.

The hair was singed, the scalp was burned and tattooed with powder grains so that the skin was black over an area one and one-half inches in diameter. The wound of entrance in the skin was one-eighth of an inch in diameter, the edges were slightly contused and stained lead color. The hole in the skull was about the diameter of the bullet. Bullet lodged.

Photograph No. 1 is a picture of these three shots. From before backward 1, 32, black powder, 2, 38, Colt, smokeless, 3, 32, Colt smokeless.

SHOT 4—Luger automatic pistol, 7.65 millimetres caliber, steel jacketed bullet. Jacket incomplete over a small circular area at the point of bullet where the lead interior is exposed. Powder charge five grains, smokeless.

Shot fired into the cheek over malar bone backward, downward, and inward. Distance, three inches. No powder marks upon the skin. Orifice of entrance three-sixteenths of an inch in diameter and circular. Edges slightly contused and white in color. Bullet lodged.

SHOT 5—Mauser automatic pistol, caliber 7.63 millimetres, steel jacketed bullet. Shot fired at outer aspect of upper third of right thigh. Distance of muzzle of pistol from skin three and one-half inches. Powder stain one inch in diameter. A grayish smudge upon the skin without deposition of distinct grains.

Wound of entrance circular, three-sixteenths of an inch in diameter. Edges slightly contused, white in color, wound of exit on inner surface of limb, oval, three-sixteenths of an inch in diameter, slightly ragged. Wound of entrance on inner aspect of left thigh the same. Wound of exit on

outer aspect the same The bullet then passed through the distal phalanx of left thumb and entered the barrel of sand

Although the bullet passed through the centre of both limbs, neither femur was fractured

SHOT 6—Mauser pistol Fired into upper third of right thigh at a distance of one foot from the skin Full jacketed bullet

A few black specks or grains are adherent to the skin around the wound over an area three inches in diameter These are readily wiped off with a dry cloth The bullet caused a fracture of the right femur, and passed across the body in a slightly upward direction, and was found under the skin just above the left great trochanter The bullet was somewhat deformed as shown

SHOT 7—Hopkins and Allen, 32 caliber, Smith and Wesson black powder ammunition Fired at outer aspect of right thigh, distance, one foot Skin tattooed with powder grains too numerous to count over an area three and one-half inches in diameter Wound of entrance circular, three-sixteenths of an inch in diameter, edges stained with lead Bullet lodged

Inasmuch as the changes produced in the skin by the smokeless powders were found to be so slight even at very short distances, it was thought useless to fire shots at greater ranges

The only shots producing stains which could not be wiped away were the Colt 38, which produced a small and barely perceptible smudge upon the scalp at a distance of three inches, and the Mauser pistol, which produced a slightly more perceptible smudge at the same distance At one foot none of the shots left any permanent powder marks upon the skin

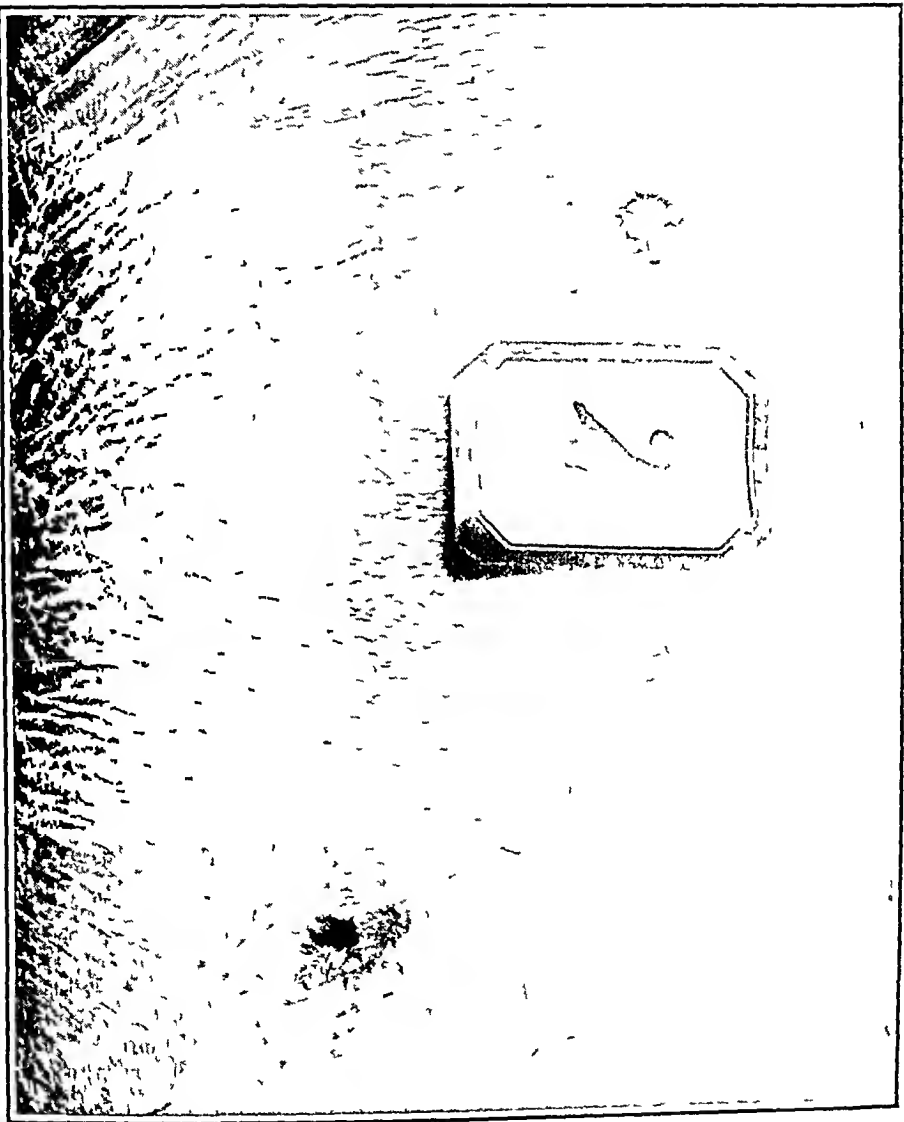
Photograph No 2 is a picture of two shots fired into the thigh with the Mauser pistol at one foot, and three inches, respectively

Photograph No 3 is a picture intended to show the different effects of a 32-caliber revolver loaded with black powder, and the Mauser pistol loaded with smokeless powder, each at a distance of one foot

Some shots were then fired with a 12 gauge Parker shot-gun, loaded with bird-shot and smokeless powders, to determine the character of the wounds produced at different distances, more especially to note how far the charge of shot continued to act wholly or in part as a single missile

The subject was suspended by the head in the erect posture and all the shots but one were fired from in front The thickness of the body through the abdomen from before backward was eight and one-half inches

FIG 2.—Two shots fired into the thigh with the Mauser pistol at one foot, and three inches, respectively



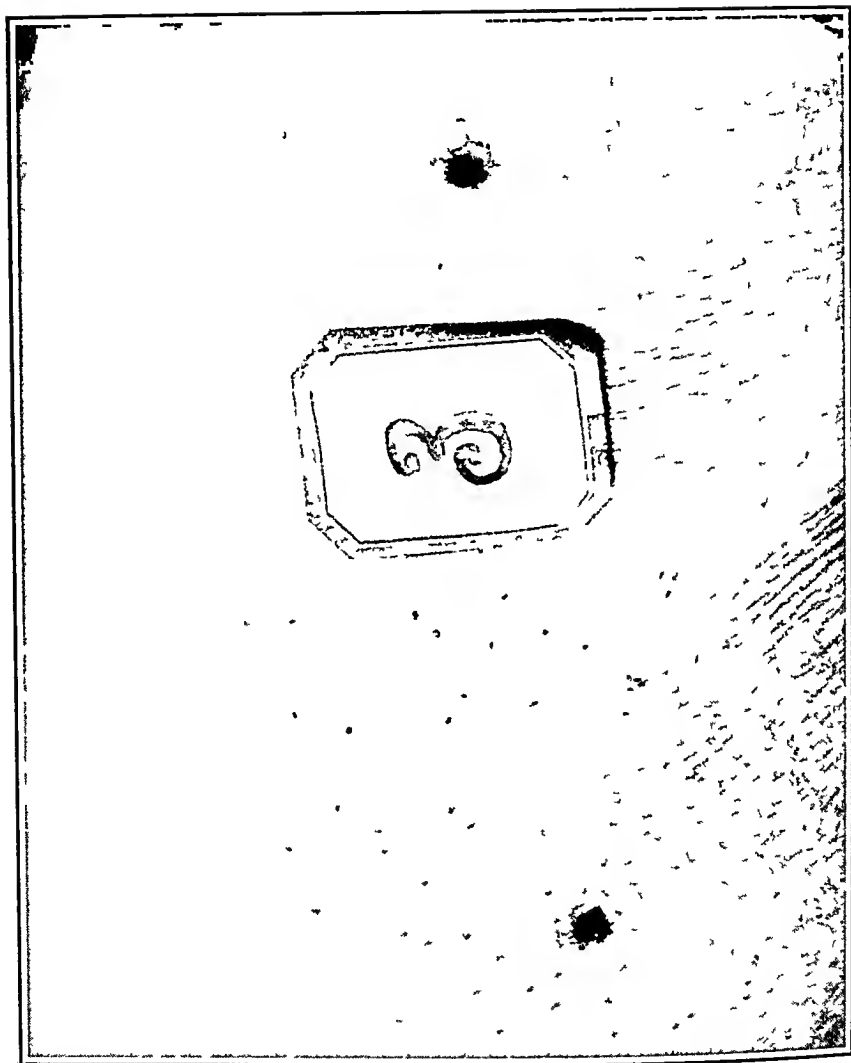


FIG 3 — 32 caliber revolver black powder, at one foot showing tattoo marks
less powder, at one foot absence of tattoo marks

SHOT 1—Shell loaded with thirty-seven grains Dupont smokeless powder, said to be the equivalent of three drachms of black powder, one and one-eighth ounce No 4 shot. Shot fired at the umbilical region. Distance, eighteen feet. Spread of shot, three and one-half inches. In the centre a ragged hole two inches in diameter was torn through the abdominal wall. There is a distinct bulging in the back, forming a soft tumor nearly in the middle line, and individual shot can be felt embedded in the skin of the back over this area.

SHOT 2—Same load, distance, thirty-five feet. Shot fired at epigastrium. Spread of shot over an area seven inches in diameter. Shot wounds discrete, except in the centre, where there is a ragged hole one inch in diameter through the abdominal wall. In this hole there lies embedded a powder wad. Shot did not emerge from back.

SHOT 3—Cartridge loaded with twenty-four grains Ballistite smokeless powder, said to be equivalent to two and three-fourths drachms of black powder, one and one-eighth ounce No 9 shot, distance, eighteen feet.

Shot fired at lower part of abdominal wall on the left of median line. Spread of shot six by six inches. There is a ragged hole through the abdominal wall one and one-half inches in diameter, and a soft bulging tumor just above the crest of the ilium behind.

SHOT 4—Load, new Schultze powder, thirty-nine grains, equivalent to three drachms of black powder. One and one-eighth ounces No 7½ shot—what is known as a pigeon load.

Shot fired at the thoracic wall near the nipple, distance, eighteen feet. Spread of shot over an area six inches in diameter. A ragged hole one and one-half inches in diameter in the thoracic wall. A good many of the shot passed through the thorax emerged from the back and embedded themselves in the barrel-staves behind.

SHOT 5—A shot was then fired through the thorax at a distance of six feet, from behind. There were no powder marks on the skin. The wound of entrance was but little larger than the caliber of the gun. The wound of exit was a slit three inches in length. Nearly the entire charge went through the thorax and embedded itself in the barrel behind, including a powder wad which was found wedged in between the barrel hoops. Fragments of lung and heart tissue were plastered on the barrel, and the wall of the room was extensively splattered with the same material.

While we all have realized from experience that a shot-gun fired at close range produced great destruction of tissue it was to me at least a surprise to find that at so great a range as thirty-five feet a considerable part of the shot held together sufficiently to produce the effect of a single missile.

Even at a distance of eighteen feet I should not have expected such a destructive effect from a charge of fine bird-shot.

A number of pistol-shots were then fired with a linen hand-

kerchief as a target, a piece of woollen cloth was then used, and then some squares of cardboard. The distances were three inches, and one foot.

It is to be noted that the smokeless powders produced only very slight discolorations of the linen cloth even when fired at a distance of three inches, upon woollen cloth no effect was produced appreciable by the eye, except a faint dark stain around the edge of the bullet hole. Some differences are to be noted between the effects produced on linen by the Colt's and the two German pistols.

The Colt cartridges are loaded with a green granular powder, probably Walsrode. This powder produces a faint speckled discoloration which when examined closely is found to consist of a moderate number of rather large, brownish-black grains, adherent to but not deeply embedded among the fibres of the flax. No scorching effect can be detected. Under a microscope, these grains resemble the fused masses of slag from a smelting furnace.

The Mauser and Luger pistols are loaded with a powder which consists of thin squares of a dark grayish-black color, evidently cut from a sheet of the material from which the powder is made. I have been unable to learn the name of this powder, but it closely resembles the powder known as Ballistite in appearance, although the squares are smaller. These powders produced a faint grayish smudge upon the linen cloth at a distance of three inches. No distinct grains can be distinguished with the naked eye.

Under the microscope the discoloration is seen to consist of numerous fine black angular grains embedded among the meshes of the flax fibres, the grains are about equal in diameter to a single fibre of flax, and their distribution is quite different from that noted with Walsrode powder, the grains are also much smaller and more numerous.

The changes produced in linen by black powder are quite different.

At a distance of three inches the cloth was set on fire around the margin of the bullet hole. The cloth was scorched

and discolored over an area more than three inches in diameter, and numerous powder-grain marks are scattered over the scorched area. Under the microscope these marks are found to be due to the presence of a large amount of brownish-black granular material plastered on the surface of the flax bundles. The scorching of separate bundles of fibres is also quite evident.

When fired at cardboard the same differences are to be noted between black and smokeless powders. The black powder causes scorching of the paper at very short distances (three inches), together with numerous marks of powder grains driven into the paper. At the distance of one foot the scorching is absent, but the powder grains are still very numerous and black. The smokeless powders fired at three inches cause slight smudging of the paper and numerous little indentations of the surface of a gray color.

The Mauser cartridges cause more discoloration of the paper and fewer indentations than the Colt.

At a distance of one foot the Mauser produces scarcely any perceptible mark, and the Colt produces a few slight indentations and no discolorations.

Although these experiments are few in number and by no means complete, a few conclusions may I think be drawn from them.

- 1 Powder marks upon the skin and clothing produced by smokeless powder are much less distinct and definite than those caused by black powder.

- 2 With the weapons used in these experiments, such marks cease to be produced when the distance exceeds one foot and the shot is fired at the naked skin.

- 3 At a distance of three inches or less powder marks may be present, but they will always be faint, and may in many instances be wiped away from the skin with a wet or dry cloth.

- 4 If the shot be fired at a part of the body covered with clothing, no powder marks at all will be found upon the skin. The clothing will never be scorched, no matter how near the weapon is held.

If the clothing be wool, no powder mark is likely to be

detected upon it even at the closest range, unless under the microscope. If the clothing be of linen, a faint mark may be found upon it if the weapon were held at a distance of three or four inches or less. If the distance much exceeded this no mark would be produced.

The evidence furnished by a microscopic examination of the pieces of linen appears to me to be quite interesting.

It is evident that by this means it might in certain instances be possible to state with some positiveness that a certain kind of ammunition had or had not been used.

Such a conclusion might be of the greatest importance from a medicolegal stand-point.

Further experiments of this character with many different varieties of powder would, I think, be worth while.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 13, 1904

The President, HOWARD LILIENTHAL, M D, in the Chair

COMPLETE EXCISION OF SCAPULA FOR SARCOMA

DR LILIENTHAL presented a young girl who had been shown at two previous meetings of the Society. Less than a year ago she developed a round-celled sarcoma of the scapula, which was first treated by means of the X-rays and injections of Coley's fluid. As a result of this treatment there was temporary improvement followed by a sudden increase in the size of the tumor, and without further delay the entire scapula was excised, leaving only the glenoid cavity. Both the wing and spine of the bone were found to be involved by the sarcomatous process. The wound healed by first intention, and the immediate functional result was excellent. For several months after the operation the injections of Coley's fluid were continued, and subsequently the patient was kept under careful observation. About six weeks ago a soft, movable mass, about the size of a hickory-nut, was felt in the stump of the scapula. This was removed, and proved to be a soft mass directly connected with the bone. The latter was thereupon removed, completing the total excision of the scapula.

Dr Lilienthal said the case illustrated the importance of very complete excision in cases where bony tissue was invaded. Another interesting feature was the excellent functional result in a case where the entire scapula had been removed so recently. The patient had very good use of the arm, and its function was constantly improving. The speaker thought this might be due to the fact that the operation had been done in two stages.

SUPRAPUBIC PARTIAL PROSTATECTOMY

DR F TILDEN BROWN reported the history of a man, sixty-seven years of age, who was first seen by him in October, 1902. The man was in excellent general health, but for five years had had increasing difficulty in urination, characterized by moderate frequency, always tardiness in starting stream, dribbling, and sense of unemptied bladder at termination. On a few occasions of retention and for examination purposes, different doctors have passed a catheter. Residuum after urination has been from five to ten ounces. On one occasion of retention used catheter himself.

Physical Examination—Heart negative. Vessel walls slightly thickened. After passing four ounces of clear urine, an easily introduced rubber catheter finds twelve ounces residuum at nine and one-fourth inches urinary distance. Kidney excretions normal, excepting for moderate polyuria.

Rectal examination shows a half-lemon sized prostate. Slight median furrow discernible. Both lobes of uniformly firm elastic consistency. The right noticeably the larger. Cystoscopy revealed an intravesical collarette, only interrupted by a fissure between the median and smaller left lateral lobes. No cystitis.

Suprapubic operation in September. Gas and ether anæsthesia. Moderate Trendelenburg posture. The sheath of the operator's cystoscope, carrying a cold lamp, was passed through the urethra to the bladder. This was used first for irrigation purpose, then for vesical distention before opening the viscus above, and during the remainder of the operation as the source of illumination for the surgical field. The then protruding prostatic lobes, with a moderate fissure between the median and left lateral, resembled a large cervix uteri with a unilateral laceration.

A vertical incision was made with a galvanocautery knife through the mucosa over the larger right lobe, which, with the median, was then enucleated. The presence of the cystoscope in the urethra served to gauge the intervening urethral wall. The left and smaller lobe was not removed, on the ground that by itself no barrier to urination would result, and that any needless traumatism should be avoided.

Bladder drainage was provided for by two small, soft, rubber-angled catheters conjoined at their lateral eyes by a silk

stitch, one led out through the urethra the other through the suprapubic wound. This simple means was always effective in keeping dressings and bed perfectly dry. When the vesical wound, which had been sutured in the greater part, was ready to close, the catheters were freed by severing their connecting stitch with delicate scissors through the suprapubic wound. The short-angled catheter was then left in the urethra a few days longer. The patient made practically an uninterrupted recovery and left the hospital on the twenty-fourth day after operation. At this time there were between one and two drachms of residual urine. The urinary distance changed from nine and one-fourth inches to seven and three-fourths. The urine was passed in a continuous, forceful stream such as the patient likened to that of his youth. Subsequent examination has never found more than a drachm of residuum. Moderate polyuria persists, and he gets up twice at night for urination.

PERINEAL GALVANOCAUTERY PROSTATOTOMY

DR BROWN presented a man, aged seventy-nine years. A well-preserved, vigorous old man except for the exhaustion and depression due to a recently increasing obstructive cystitis. At twenty-two had urethritis, at fifty-five, pneumonia.

About two years ago he began to have frequency of urination, this was gradually augmented and pain became associated. When first seen, in April, 1903, he was obliged to urinate every half-hour night and day. Restful nights were impossible, but he continued to go to business daily. Urine was that of marked acid cystitis. Tuberculosis was excluded. Residual urine was between four and six ounces. Urinary distance, eight and one-half inches. Rectal examination showed prostatic enlargement of triangular shape, laterally. Right lobe two by one and one-fourth inches, left lobe one and three-fourths by three-fourths inches. Interlobular furrow distinct. No nodules. Uniform consistency. Cystoscopy revealed only a moderate intravesical projection of the lateral lobes, but a fairly prominent elevated lip stretching between them. Vesical mucosa showed a high grade of chronic cystitis.

Brief local and systemic treatment was attended with considerable improvement. Patient was not seen then for six weeks. On his return, the former distressing symptoms had recurred.

Against his inclination, he consented to go to the hospital for proper attention and observation, a few days of the latter convinced the speaker that some form of operative interference was indicated. Because of his age and marked mental and physical depression, as well as the high bladder floor and the perineal drainage which his cystitis required, Chetwood's operation appeared to be indicated in preference to perineal prostatectomy. This was done with Dr Chetwood's valuable assistance on September 3, under gas and ether anæsthesia, the patient being in the lithotomy posture. Through an incision entering the membranous urethra the galvanocautery incisor was passed into the bladder. The Chetwood technique was then carried out on each lateral lobe and on the intervening lip or bar. Thereby the floor of the bladder was appreciably lowered. A large, soft rubber perineal catheter was left in the wound until the end of the fourth day. Except for some mental aberration lasting three days, the patient made an uneventful convalescence.

Urine ceased to come through the perineal sinus by the twenty-first day. Urinary intervals were daily increasing and amount of residuum decreasing, so that at the time of his leaving the hospital on the twenty-seventh day after operation this was practically nil. The urine then still showed a decided cystitis. At the present time he has regained a degree of health such as he had not known for three years. His urinary intervals are now from four to five hours. There is no residuum whatever. The urine still shows, and probably always will, a colon bacillus cystitis, but with the removal of obstruction it is practically symptomless.

DR L. W. HOTCHKISS asked Dr Brown whether he regarded the suprapubic operation on the prostate as a more dangerous procedure *per se* than the perineal method? The question had excited much controversy, and was still, apparently, unsettled. The suprapubic route gave the operator an excellent command of the bladder, and seemed to be the more natural method of entering it, providing, of course, there were no special contraindications.

DR BROWN, in reply to Dr Hotchkiss, said his experience with perineal prostatectomy was rather limited. He thought that a freer access to the field could be gained by the suprapubic route, and he was always pleased when there was some element about the case which enabled him to see a possible advantage for the suprapubic operation, in contradistinction to the perineal. The

wonderfully rational technique of the method of perineal prostatectomy that had recently been brought before the profession by Dr Young had appealed to him, however, both from an anatomical and physiological stand-point, and consequently his first prejudices against this route would in the future be greatly minimized.

DR LILIENTHAL said he had had considerable experience with suprapubic prostatectomy, and he saw no good reason why he should substitute any other method. He regarded suprapubic prostatectomy as a safe surgical procedure when compared with other similar operations in that region. The method afforded an opportunity of examining the bladder, it rendered possible the removal of encysted stones which could not be removed from below, and at times revealed the presence of a diverticulum or tumor which might otherwise have remained undiscovered. In short, it was beyond question the most surgical method of gaining access to the bladder. With a suprapubic wound for removing the enlarged prostate, he did not think it necessary to make an additional opening through the perineum for the purpose of drainage or anything else. The latter was often more difficult to close than the upper wound. All things considered, he thought it better to leave the bladder wound open, and not make any effort to hasten its closure by suture. In his last case, the suprapubic wound had closed entirely in two weeks, and the patient passed all his urine through the natural passages. In another case he had in mind the wound had closed entirely, and the patient left the hospital in fifteen or sixteen days after the operation. In neither case had any attempt been made to suture the wound in the bladder. His method of opening the bladder was as follows: it was first merely punctured, and then the opening was enlarged by inserting a dressing forceps, this did not actually tear the walls of the bladder, but merely separated them, and they readily recontracted.

Dr Lilienthal said he was glad to observe that some of the more progressive men had come out squarely in favor of suprapubic prostatectomy. In the January (1904) issue of the *ANNALS OF SURGERY*, Moynihan, of Leeds, reported twelve cases he had done by the suprapubic method, of which he thoroughly approved. In his article the writer mentioned that in doing the suprapubic operation there was a likelihood of tearing out a part of the pros-

tatic urethra Dr Lilenthal said he did not think that accident would occur if the work was not done too hurriedly It could be avoided by good surgery, and even if the accident did occur it would probably not result in stricture, as the prostatic urethra was of so great a caliber that a section of it could be sacrificed without much harm

DR BROWN, in reply to a question as to whether he would again resort to perineal prostatectomy by the Chetwood method in a similar case, said that he would The patient was an old man, in a very feeble condition as the result of his continued urinary suffering It was very doubtful whether he could have withstood a prostatectomy His mental symptoms after the milder operation would probably have appeared in an aggravated form after a severe operation He was, in short, on the borderline, where any additional strain might have resulted in a fatal issue

In a more recent case, Dr Brown said, he had been induced, against his better judgment, to do a perineal prostatotomy by the same method in a case where either a suprapubic or perineal prostatectomy was indicated, but refused by the patient The result, up to the present time, had not been very encouraging This was possibly due, the speaker said, to his inexperience with the Chetwood instrument or to the brief time since the operation, the patient not yet being out of bed

EPITHELIOMA OF CHEEK EXCISION AND PLASTIC OPERATION

DR IRVING S HAYNES presented a man, thirty-six years old, with a negative personal and family history, who about a year ago developed an epithelioma of the interior of the left cheek It measured about an inch and one-half from before backward, and involved practically the entire thickness of the cheek The lesion was excised, and the gap left in the cheek was closed by the following plastic operation A tongue-shaped flap was carried up from the neck and inverted, so that its external surface corresponded to the former mucous surface of the cheek This flap was sutured to the gum above and below, and took very readily

* Since the above remark, the results now noted, ten days later, justify its retraction, catheter tests showing improvement

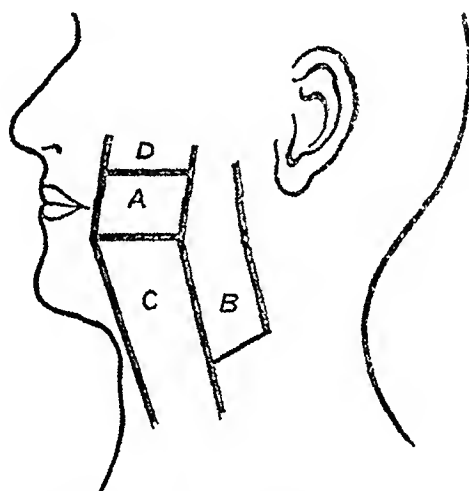


FIG 2—Epithelioma of cheek Excision Result of plastic operation

A second flap was then carried up from the neck, and, without inverting it, it was placed so as to cover the outer raw surface of the first flap. After two weeks the base of the inverted flap was excised and turned downward, partially covering the denuded area left from the first operation. All the wounds healed without complication, with the exception of a slight infection, which was probably due to the too energetic use of Balsam of Peru for the purpose of hastening granulation.

Dr Haynes said that the hairs on the inner surface of the first flap had grown somewhat since the operation, but its surface was beginning to assume the appearance of mucous membrane. The opening into the mouth which had existed until now along the base of this inverted flap was closed.

FIG 1



Plastic operation to reform cheek. *A*, Quadrilateral area involving entire cheek excised, *B*, Flap turned into mouth to replace mucous membrane, left attached by its base until union was secured, *C*, Flap slid upward and *D* flap slid downward to cover the raw surface of *B*.

Healing was rapid and the wounds closed, giving a good result without leakage. The diagram shows the direction of the incisions, and the photograph (Fig 2) the appearance at the time of his discharge. The dark area below the lobe of the ear is a small granulating area, left by raising the flap for the interior of the cheek.

DR CHARLES H. PECK said that about a year ago he showed to the Society a case of epithelioma of the cheek in which an operation somewhat similar to that of Dr Haynes was done. The lesion was a very large one, measuring about two and one-quarter by one and seven-eighths inches, and the ulceration had extended

between the buccal folds to their reflections upon the upper and lower jaws. The gap left in the cheek by the removal of the lesion was closed by a flap carried up from the neck, but it was not inverted, as in Dr Haynes's case. The result was excellent, but there was subsequently a recurrence in the scar, which necessitated a second similar operation, excepting that the flap was carried downward from the forehead. The result of the second plastic procedure was again satisfactory, and death finally occurred from metastases in the lungs.

EPITHELIOMA OF THE TONGUE

DR HAYNES presented a man, forty-seven years old, who four months ago first noticed a small pimple on the left edge of the tongue. It gradually increased in size, and on December 11 last he had a severe hæmorrhage caused by ulceration of the process through the terminal branch of the lingual artery. The bleeding was so severe that it was only controlled by passing a mattress suture through the tongue. Subsequently, the anterior two-thirds of the tongue were removed, the excision being preceded by ligation of both external carotids. At the time of the operation the left submaxillary gland, which was somewhat enlarged, was also removed. The stump of the tongue was drawn downward and anchored to the floor of the mouth by means of a deep mattress suture passed through the tongue and floor of the mouth and tied just behind the symphysis so as to cover the large raw surface that remained. Healing had been satisfactory. The man could make himself understood without difficulty.

DR F W GWYER said that a few years ago he had a case of epithelioma of the tongue in which he excised the lateral half of the organ, and then curved the tip of the remaining portion around to the base and stitched it in that position, so that it resembled a parrot's tongue. This gave an excellent result, so far as the power of speech was concerned. A recurrence took place after one year.

LYMPHATIC CONSTITUTION CARE OF THE LYMPHATICS DURING AND AFTER OPERATIONS

DR F W GWYER read a paper with the above title, for which see page 641.

DR JOSEPH A BLAKE said that a few years ago he read a

paper upon this subject, and had reported seven cases. In three of these death had occurred under ether anæsthesia,—in one under chloroform and in three no anæsthetic had been given. Although the presence of an enlarged thymus was not absolutely essential in this condition, it was of considerable corroborative significance, in fact, all these cases were regarded as instances of thymus death before the general lymphatic condition was understood. The condition of the spleen was also of importance.

Dr BLAKE said that in the extirpation of tuberculous glands in the neck or axilla he could recall a number of instances where prolonged manipulation was followed by hyperpyrexia and even by death. In operating on these cases, he preferred a free dissection, similar to that employed in the removal of malignant growths. By the usual method, with blunt dissection, the glands were manipulated a great deal, and their contents squeezed into the general circulation, and this, the speaker thought, caused the infection and evanescent temperature.

Dr LILIENTHAL asked Dr Gwyer how he sterilized the vaseline that he injected into abscess cavities and applied externally before operating for empyema. Personally, he had always been inclined to believe that vaseline, once infected, could not be rendered sterile by boiling without burning it.

Dr GWYER replied that he sterilized the vaseline by boiling it for about fifteen minutes over a water-bath. It was then put in collapsible tubes of good size and was ready for use, keeping sterile indefinitely.

Dr IRVING S HAYNES said he had come to the conclusion that in children under four years of age ether was a safer anæsthetic than chloroform, in spite of the fact that the use of the latter was particularly advised by the text-books in those patients. He recalled four cases where the use of chloroform in children under four years of age nearly resulted fatally in his hands. In older children and adults where there were no contraindications, he preferred chloroform.

Dr BLAKE said that the report of the committee appointed by the British Medical Association showed very clearly that chloroform was most dangerous during the first decade of life. This was contrary to the general impression held by the profession. The proportion between the number of chloroform and ether

deaths was much greater before than after the age of ten, and favored the latter anæsthetic

DR GWYER, in closing, said he did not wish to have it inferred from his paper that he favored blunt dissection in all cases and at all times, but he thought that the sharp and clean dissection method should not be used exclusively, that there was a place for both in the technique of operations

STRANGULATED PARTIAL ENTEROCELE THROUGH THE OBTURATOR FORAMEN

DR LUCIUS W HOTCHKISS said that at one of the recent meetings of the Society he had read a paper on this subject in which he reported five cases of Little's hernia, including both the femoral and inguinal variety. The specimen he now showed was of the obturator variety, and was not recognized before death. The patient was a German woman, seventy-one years old, who was admitted to the J Hood Wright Memorial Hospital on December 26, 1903, at 2 40 P M. For a long time she had suffered from cough, and about ten years ago she first noticed a hernial swelling in the left groin. Two days before her admission she began to suffer from abdominal cramps, and twenty-four hours later persistent vomiting had set in. The bowels had not moved for three days, despite purgatives and enemata, and the abdomen had become considerably swollen. Prostration was marked, the body surface cool, pulse feeble and rapid. Temperature was 99.4° F, pulse, 112, respirations, 40. An examination of the blood showed 8400 white cells. The urine was negative.

An examination of the abdomen showed that the distention was more marked over its lower half, it was tympanitic and moderately tender. In the left groin there was a reducible inguinal hernia about the size of a lemon. The patient was immediately given a high enema containing turpentine and glycerin, this resulted in a large, constipated movement, with much gas. The pain was temporarily relieved. At 8 P M the same day the enema was repeated, with a satisfactory result. During the night, however, the patient grew worse, and by morning her temperature had risen to 103° F, pulse, 110. The pain was more severe. The patient was vomiting and evidently sinking. At 4 P M her temperature was 106.8° F, pulse imperceptible. She died at 4 30 P M on December 27, the day after her admission.

Autopsy—The peritoneal cavity contained about ten ounces of bloody serum. The intestines were injected and the ileum markedly distended down to a point fifty inches from its lower extremity. At this point the gut passed into the obturator foramen on the right side, and below it was collapsed to the ileocaecal valve. The obturator hernia was reduced by moderate traction, and found to be a partial enterocele, comprising about one-half the circumference of the gut, which was strangulated and minutely perforated. A well-defined sac was found, acutely inflamed and containing about four cubic centimetres of a stinking, brownish fluid. The sac was adherent to a mass of fatty tissue.

TORSION OF THE UTERUS

DR JOHN F ERDMANN presented a specimen obtained from a widow, fifty years of age, who gave the following history. She had passed the menopause five years ago. During her early married life she had had three miscarriages, but had never gone on to complete pregnancy. Last August she had an attack of abdominal pain, accompanied by considerable shock, which lasted three days. Some eight months ago she had a second similar attack, lasting two days, and her third attack came on a week ago. When Dr Erdmann saw her in consultation last Sunday afternoon, she had been suffering for two and one-half days, there were considerable collapse and a temperature of 102° F, pulse, 126. The abdomen was much distended, and there was a sense of fluctuation over the left side. The condition was regarded as a large uterine fibroid with a twisted pedicle, or an ovarian cyst. Upon opening the abdomen he found that he had to deal with a torsion of the uterus, with its pedicle twisted two and one-half times from right to left. He could not at first make out what this pedicle consisted of, but later, upon investigating, it proved to be the cervix elongated and attenuated. The organ was removed *in toto* together with its appendages, and the patient made an uneventful recovery.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY

Stated Meeting, January 4, 1904

The President, RICHARD H. HARRIE, M D, in the Chair

RHINOPHYMA

DR W W KEEN presented a man who had been subjected to operation for the relief of rhinophyma. For the account of the case, with remarks upon it, see page 665

THE TREATMENT OF FRACTURES

DR GWILYM G DAVIS delivered an address on this subject, this being the Annual Address in Surgery, for which see page 778

DR W W KEEN took exception to the writer's commendation of the use of silicate of soda or starch as primary dressings. They will not hold the parts in place until the dressing hardens, and hence allow displacement of fragments. Dr Davis had also spoken of plaster-of-Paris dressings, but did not specify the mode of their application. If applied simply by circular turns, then they are open to objections, such as interfering with proper cleansing of the parts, massage, etc. If they are applied as splints, they can be used as a fixed dressing, and still be removed to allow of access to the parts. Dr Keen has recently seen a new form of plaster splint, his attention having been directed to it by Mr Rebman, of London. It consists practically of a bag one metre in length and from two or three to five or six fingers wide. This is impregnated with plaster, a mesh passing down in the centre to give stability. One can take any amount, six inches to two or more feet, put it in water, prepare it properly, and apply as a

splint. It adapts itself readily to the surface with which it is placed in contact, and thus furnishes a reliable support. This splint is the idea of Dr. Sahli, of Berne. Dr. Keen was glad to hear Dr. Davis speak words of caution regarding the injudicious use of passive motion in the treatment of fractures. In his early career he had under his care cases of Colles's fracture in which he wished to employ passive motion. This he did by flexing the fingers until the hand was made into a fist and then bending the wrist. If any one will try this manipulation, he will readily see what a small amount of flexion of the wrist can be given without causing pain even in a normal hand. If the fingers are straightened, the wrist can be flexed to a right angle with no pain. The surgeon too often forgets the normal limit of movement when he is using passive motion in a fractured limb.

DR. OSCAR H. ALLIS said that Dr. Davis had in his address furnished enough material for a half-dozen or more papers. Any one point, such as treatment of fracture of the thigh or elbow, or massage in the treatment of fractures, would have been sufficient for discussion. He wished to speak regarding simple fractures of the femur. These fractures may be produced in one of three ways: (1) when the force is exerted at right angles to the long axis of the bone; (2) when the force is parallel or in the direction of the long axis; (3) by twisting. In many instances there is an independent fragment of bone. In oblique and especially in spiral fractures where the forces meet there will be found towards the central part of the bone one or more small fragments. In the X-ray we have a valuable adjunct in making a diagnosis. If the surgeon will make use of this and find the exact condition of the injured part, he will enter upon his work in caring for it with far more assurance. It is too true, even lamentably true, that surgeons do not often enough open joints when dealing with fractures that extend into them. In the case of fractures into the knee-joint, the semilunar cartilages may be torn or twisted out of their place, or the crucial ligaments be torn and form practically foreign bodies. Even if the fragments are brought together, there is often a lack of good results in these cases, because the torn structures are pinched between the bones. It should be almost an axiom in fractures involving a joint to open and remove any spicules that may be present. The prevention of angular deformity following fractures of the upper part of the femur is

one of the most difficult problems in all surgery. When the fracture is oblique and can be wired above and below, fixation is possible. When the fracture is transverse, deformity is almost sure to follow even when wiring is resorted to.

DR DAVIS, in closing, said that it was a very difficult question what to include and what to exclude. He had avoided the discussion of individual fractures and confined his address to the consideration of principles. Regarding Dr Keen's reference to silicate of soda and starch, he thought there was a misapprehension, as he had not intended to advocate their use as primary fixed dressings. The silicate of soda takes twenty-four hours to harden, and is not immediately adapted to hold bony fragments in position. At the end of ten days, when the parts are fairly firm, this dressing may be used. Starch is not so firm as the former, but helps to keep the turns of a bandage in position and prevents slipping. When plaster-of-Paris is used as detailed by Dr Keen, it resembles an ordinary splint.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, February 1, 1904

The President, E. WYLLYS ANDREWS, M.D., in the Chair

APPENDICITIS

DR E. C. DUDLEY reported a case of appendicitis in a young woman, and showed the specimen. The appendix, which was about the size and length of one's finger, was very much constricted at its entrance to the bowel. After the removal of the appendix and squeezing it with considerable force, a drop or two of pus came out, which contained staphylococci. The lumen of the appendix was almost entirely shut off at its junction with the gut, and, in all probability, would have been soon shut off and when this had occurred, if pus had continued to form he thought gangrene of the appendix would result, with rupture of the organ before long.

ACCIDENTAL WOUNDING OF THE URETER IN VAGINAL HYSTERECTOMY, URETEROCYSTOTOMY

DR E. C. DUDLEY read a paper with the above title, for which see page 755.

DR A. J. OCHSNER said that Dr. Dudley had made application of a principle which was not used enough by surgeons. In attaching a tube to any surface in surgical work the same principle could be employed to advantage. For instance, in attaching the trachea through a button-hole in a case of laryngectomy in this way it would not contract, while, if it was sutured to the skin directly it would. In transplantation of the urethra into the perineum, by making a button-hole and carrying the urethra through and applying the same principle there would be no stric-

ture at the end of the new urethra. Where one had occasion to attach a tube, which was lined with mucous membrane, as where a long portion of the lower part of the rectum had been excised and the bowel transplanted over the end of the sacrum, where one made the incision as in the Kiaske operation, this principle of drawing the intestine through the skin would obviate the occurrence of stricture at the end of the rectum.

DR JOHN B MURPHY emphasized the point with reference to opening the bladder. The way in which bladder surgery in the female had been done in the past in the great majority of cases, with only a few exceptions, was through the urethra. Bladder surgery in the female should be done entirely through an artificial vesicovaginal slit, and the bladder opened without hesitation. In the last year and a half he had split the female bladder from the sphincter back towards the cervix of the uterus, turning the bladder out, exposing the ureters, doing any work that was necessary to be done, and sewing up the wound with horsehair sutures, securing primary union in every case except one, and this only required one secondary operation. For the treatment of ulcers of the bladder, papilloma, the removal of stones from the vesical end of the ureter, instead of removing them through an uretero-vaginal incision, as was formerly done, the bladder was opened, and its wall was divided in the direction of the bladder to remove the ureteral stones. The incision should be made through the vaginal wall, a probe or director passed into the ureter, and the ureter divided with scissors. Stones and tuberculosis of the lower end of the ureter are usually situated at that particular point in lower half-inch of ureter just outside the bladder. In one case he opened in the other direction and had some difficulty in closing the ureter. Where it was necessary to pull the bladder down with retractors, one could pull it clear out of the vulva and do any work that was necessary on the bladder or ureter through a vaginal incision. There was very little danger of a permanent fistula. The incision was clean-cut. In a case of vesicovaginal fistula following instrumentation in labor, there was necrosis from a crushing injury, hence there was a tendency towards the formation of a permanent fistula, while the tendency in the incision condition was prompt healing of the clean-cut incision.

DR GUSTAV KOLISCHER said that when he saw the operation described by Dr Dudley performed, he was impressed with its

feasibility The operation was conceived in a minute and performed in a short time That the method was practicable, there was no doubt, and he felt sure it would be employed in similar cases in the future, but whether it was absolutely necessary to operate by this method was another question, that is, fastening the ureter into the bladder after a special incision for this latter purpose was made In 1898, when the speaker maintained that surgeons should not dilate the female urethra in order to perform endovesical operations, but should operate through an artificial, temporary vesicovaginal fistula, he was attacked rather fiercely, although he could show very good results It was a personal satisfaction to him to see Murphy take up and recommend rather emphatically this way The dilatation of the female urethra had been too long kept up, mostly due to the weight of authorities like Kelly and Saenger He agreed with Dr Murphy that the danger of a permanent fistula after such an incision hardly existed There was no loss of substance, and no cicatricial contraction as in obstetrical vesicovaginal fistulas, and primary union after plastic operations would always take place if the lips of the wound could be approximated without any tension

REVIEWS OF BOOKS.

A TEXT-BOOK OF OPERATIVE SURGERY, covering the Surgical Anatomy and Operative Technic involved in the Operations of General Surgery By WARREN STONE BICKHAM, M.D., Assistant Instructor in Operative Surgery in the College of Physicians and Surgeons of New York Philadelphia W. B. Saunders & Co., 1903

It is with a feeling of pride that the writer congratulates Dr Bickham upon his "Text Book of Operative Surgery." He is proud of the fact that a classical work on this subject has been written by an American teacher. A careful perusal of the work shows but few defects, and it is hoped that the criticisms which are offered will be accepted as being given with the best of intentions.

As a book of reference for the surgeon who desires to refresh his memory as to the details of an operation and the various methods of performing it, this work can be heartily recommended. If, however, it is to be used as a text-book for our medical schools, its curtailment is to be greatly desired.

It seems to the reviewer that if this book were changed so that it were a little more critical as to the value of every operation described, and at the same time omit describing as a separate operation some little difference in technique, it would be a more useful book for both student and practitioner.

The surgeon who consults this work will be astounded at the immense amount of painstaking labor which must have been expended in its preparation. The illustrations, quality of paper, and clearness of text show the highest type of work.

The book is divided into

Part I Operations of General Surgery

Part II Operations of Special Surgery

The author begins each chapter with a list of the anatomical structures in the particular region. It would seem to the writer to be far more desirable in future editions to have one drawing illustrating the surgical anatomy of the structure, and a brief description of the principal parts involved, in place of enumerating in detail every artery, vein, nerve, etc., which chances to be in the region. A few diagrams will save much dry anatomical text.

Chapter I is devoted to the subject of ligation of arteries. The description of so many different methods of ligation of the same artery is confusing to the student. By giving one typical mode of ligation of each of the larger arteries, with a brief reference to variations from it, and a critical review of the same, this chapter could be made far more readable. It would also be desirable to have arteries colored in the illustrations. The subject of suture of arteries is treated with great thoroughness. The same spirit of having even the most recent methods painstakingly described and illustrated runs through the entire work, and makes it an absolutely essential one for every surgeon to have at his command.

On page 130 one welcomes a description of how to give an intravenous salt transfusion.

In Chapter III, on the removal of cervical lymph glands, a drawing showing the relations of the vessels, etc., of the neck would seem far more valuable than the detailed anatomical description given.

One misses Cushing's operation for removal of the Gasserian ganglion. A few illustrations of the regions in which neurectomy and neurorrhaphy are most frequently performed is to be suggested.

In Chapter V (Operations on the Bones) the descriptions are explicit and well illustrated. No mention is made of the use of bronze aluminum or iron wire for bone suturing. The use of the Parkhill clamp for ununited fracture could be well omitted. The reviewer would suggest adding some more illustrations of operations for acute osteomyelitis to this chapter.

Chapter XII, on amputations, is to be highly commended. A little less detailed description of the technique of a typical amputation would be desirable.

The author has given in commendable manner the qualifications of good and bad stumps. The only criticism to be offered in this chapter is that there should be a smaller number of methods given, and these more critically.

The same is to be said of Chapter XIII, on resections.

After 457 pages devoted to operations upon bones, joints, nerves, arteries, veins, and lymphatics, the remainder of the work takes up Special Surgery. Here, again, in every chapter the reviewer desires with the best of motives to make the same suggestions. A short description of the anatomical facts of greatest importance in each region and one or two illustrations of the same quality as those in the remainder of the book, would save what seems undesirable enumeration of structures and relations.

The same criticism in regard to simplifying the number of methods given and a more critical opinion as to their relative value, holds true for the entire Part II. It would also be desirable to omit the surgery of the eye in this work, except plastic operations on the lids. A few more illustrations of operations for focal epilepsy, cerebral and cerebellar abscess, and tumor are to be suggested. The illustrations in both portions of the book are almost entirely original and faithfully portray conditions at operation. They are executed and reproduced in the most artistic manner.

The term "gut suture" is harsh and superfluous. Obsolete operations, like lumbar colostomy, could well be omitted. The chapters devoted to intestinal suture and anastomosis are classical, but for student purposes must be greatly curtailed. Too much space is devoted to less frequently employed methods of anastomosis.

Bile-duct suture with the Halstead hammer and cholecystolithotripsy could be well omitted. One misses in the chapter upon

the rectum a description of vaginal extirpation The illustrations and description of appendicectomy are excellent

The reviewer would suggest in future editions omitting the practice of describing as separate operations the same procedure, *e g*, hepatotomy, with slightly different incisions This custom of the author is to be greatly deplored

Taken as a whole, the medical profession of America can well congratulate the author for his painstaking and thorough labors It can be most favorably compared with any of the standard European books on operative surgery Throughout the book one can observe the work of a conscientious and experienced teacher

DANIEL N EISENDRATH

THE TREATMENT OF FRACTURES By CHARLES LOCKE SCUDDER
M D, Surgeon to the Massachusetts General Hospital
Fourth Edition Philadelphia W B Saunders & Co, 1903

Four editions of this work testify to its popularity It is an eminently practical work, a work-book on fractures, to which the student may turn when he wishes to know what to do in a given case The author, moreover, shows him how to do it, and has brought to his aid some 688 illustrations

The author appeals always for a more general use of anæsthetics as an aid in diagnosis and treatment, especially in injuries involving joints He takes advantage of the advancements in surgery to apply them to the treatment of fractures, showing how the Rontgen ray has contributed towards a more accurate interpretation of the physical signs of fracture, and therefore to greater accuracy and certainty in treatment The methods of treatment have been simplified The new surgery has made it possible for the patient to demand more perfect apposition of fragments, and has enabled the surgeon to resort to the bloody replacement of bones instead of remaining helpless in the presence of irreducible displacements The results which are being secured

in the open treatment of closed fractures emphasize what anæsthesia, antiseptis, and the Rontgen ray can do towards rendering knowledge of fractures more exact and treatment more accurate

Dr Scudder does not encumber his work with apparatus, but teaches the student to make each case an object of special study. Instead of dilating upon apparatus and the theories of treatment, the mind is directed to the actual conditions which exist in the fractured bone.

Mechanical simplicity is advocated. The theories of treatment are not discussed. Many fractures which are extremely rare are omitted. It is known that any bone may be fractured at any place, and the author has not attempted to describe the treatment of all the fractures which can be found in the literature. A knowledge of anatomy and an accurate observation of fractures, together with an understanding of mechanical principles, are the requisites in the treatment of fractures.

We are glad to observe the preference shown to the new nomenclature in the designation of closed and open fractures. An excellent chapter on the Rontgen ray and its relation to fractures is added to the work, also some notes upon a few of the more common dislocations.

The work systematically takes up the regions and their bones. In addition to the ordinary treatment of these subjects, we find the treatment of the complications of fractures, special attention given to the treatment of fractures of the femur in children, anatomical facts regarding the epiphyses, gunshot fractures, the employment of plaster-of-Paris, and the ambulant treatment of fractures. Practically, all of the illustrations are new. They are the most instructive of any set of illustrations of this subject.

This fourth edition is improved by the addition of a number of excellent pictures. Additions are also made to the text at various points. There have also been added a number of X-ray plates illustrating the anatomy of the epiphyses.

The author's illustration of the treatment of fracture of the

clavicle is especially to be commended. The statement that complete reduction of Colles's fracture cannot be satisfactorily made without the administration of an anæsthetic, we think is a rather extreme view. Many cases can be reduced as well without an anæsthetic as with it, but we believe that the anæsthetic is withheld in too many cases, and that Dr. Scudder's recommendation will operate in the right direction, even though his suggestion is not altogether in accord with the general experience of surgeons. The general treatment advised for this fracture is such as surgeons indorse.

The treatment of fracture at the elbow in the humerus by acute flexion is well illustrated. The extension apparatus, illustrating treatment of fracture of the thigh, is the most simple and efficient. The car and tracks of the ordinary apparatus are omitted. After the patient is allowed up, the author advises, in ordinary cases, that the free use of the limb without supports shall not be allowed till the end of twelve weeks.

In no work on surgery will the student find a fairer statement of the question of treatment of fracture of the patella than in this book. The non-operative treatment is not complicated by giving a variety of methods, but a simple and rational treatment is described which is applicable to all cases. The operative treatment is declared to be the most satisfactory, and its disadvantages are clearly stated.

In the treatment of fractures of the lower jaw the author is strongly opposed to the ordinary outside splints and bandages, and advises the interdental splints.

This book is well printed and illustrated, and is worthy of the best indorsement of surgeons.

JAMES P. WARBASSE

DISEASES OF THE EYE. By L. WEBSTER FOX, A. M., M. D., Professor of Ophthalmology in the Medico-Chirurgical College of Philadelphia, Pa., Ophthalmic Surgeon in the Medico-Chirurgical Hospital. With five colored plates and 296 illus-

tations in the text Cloth, \$4.00 New York and London
D Appleton & Co, 1904

This author again presents the study of the eye in a new dress. There is advantage in this if each new author tries to tell the story for himself from full knowledge. It will differ from that of others, but will be sure to have some points peculiarly meritorious of its own. The arrangement and conception of subject and presentation of it, as to classes of students, in finished crisp chapters, is delightful. It is new to devote a chapter to development. This and that on the anatomy which follows take up the first thirty-four pages. They are well illustrated, and need to be presented thus, because the work is for students primarily. Then follow pages 36 to 79 on diseases and operations on the lids. The operations are so liberally illustrated that the meagre text is still adequate for all the reader's needs. Unusual as it is to illustrate the lachrymal ducts, it is none the less meritorious and praiseworthy, for this is a real point of difficulty. Thus on through the book individuality appears in illustrations, descriptions, and methods of treatment not commonly adopted, *e g*, in the illustration and use of peridectomy for pannus and opaque slips for conical cornea, oddly enough even introducing a layman's description in the latter.

The publishers have given acceptable form to it.

Glossary and copious index close the volume. Our conclusion is, that if another treatise were needed just now, this one deserves a place for its own points of excellence. It is not voluminous (only 594 pages) nor exhaustive, but it is eminently practical and plain, and well meets the needs of student readers.

HEBER N HOOPLE

MOUNT SINAI HOSPITAL REPORTS Vol III For 1901 and 1902
Edited by N E BRILL, A M, M D, 1903

This volume of 575 pages contains the medical statistics of the hospital, and some thirty papers based upon the work of the hospital, by members of the staff.

Under the subject of appendicitis we find in the First Surgical Division a comparison of statistics which shows that in 1898 the mortality following operation was 18 per cent, in 1899 it was 29 per cent, in 1900, 24 per cent, in 1901, 10 per cent, and in 1902, 9 per cent. This is explained chiefly by the less severe cases being operated upon in the last two years. In the Second Surgical Division there was an operative mortality in appendicitis, in 1901, of 8.33 per cent, and in 1902 of 8.62 per cent. These figures show that the cases of appendicitis in which the general practitioner calls for surgical help are being placed in the hands of the surgeon at an earlier day than heretofore.

The statistics of operations upon the gall-bladder, strangulated hernia, carcinoma of the breast, the prostate gland, and the kidneys are fully studied. The operations upon the stomach show a mortality of about 50 per cent. Dr Gerster calls attention to the fact that the patients of the Mount Sinai Hospital are mostly Russian Jews, whose habits, mode of living, and occupations are mainly of a sedentary character. They work in confined places for long hours, and are particularly prone to suffer with diseases of the intestinal tract. Hæmorrhoids are very common among them. The large number of cases of abscess of the liver occurring in these people are attributed to hæmorrhoids. The chain of factors are as follows: sedentary habits in poorly nourished people, hæmorrhoids, traumatism and ulceration of the hæmorrhoids, infective thrombosis of hæmorrhoidal veins, thrombotic material conveyed to liver through portal vein, abscess of liver. Strictly scientific proof of this assumption is not present, but it is declared that the ordinarily accepted etiologic factors are absent in these cases, and the hæmorrhoidal hypothesis is the most acceptable.

Dr Berg has a special article in which he gives a report of sixty-six operations for cholelithiasis. The mortality of 29 per cent in these operations is explained in the character of the patients from whom the material is drawn. Most of the cases

were ignorant people, far advanced in their diseases, and who accepted operation as a last resort. Thus, out of the sixty-one cases operated upon, nineteen had empyema of the gall-bladder, four had extensive gangrene, six had obstructive jaundice, and practically all had been exhausted before operation by long periods of pain and sepsis. The wretched physical condition of these patients is evidenced by the three deaths from collapse soon after operation.

Dr Lilienthal has a report of a case of hyperplastic colitis successfully treated by resection of the entire colon, the upper portion of the sigmoid flexure, and four inches of the ileum. Dr Lilienthal also presents an analysis of his cases of hypertrophy of the prostate, in which he reports seven operations of suprapubic enucleation of the prostate with one death and five complete cures. The fatal case was that of a man sixty-five years old, who was operated upon in an emergency, and in the presence of acute sepsis of the bladder. Dr Lilienthal's analysis of these cases merits close study. He has shown what the best surgery can do in the suprapubic operation.

The tribute paid to the memory of the late Dr Paul F Munde is a model of memorial addresses.

Dr Vineberg presents a study of nine consecutive cases of ectopic gestation, and makes the statement that in all but two of these cases there was a rise of temperature. The absence of temperature in these two cases was probably due to hæmorrhage, as febrile movement due to absorption of blood products is a symptom usually present in these cases unless counteracted by the antipyretic effect of acute anemia.

This report, which reflects credit alike upon the surgery and editorial ability of the hospital staff, contains also reports of the work of the pathologists, the anæsthetists, and the X-ray department, and is a valuable contribution to the literature of surgery.

JAMES P WARBASSE

ANNALS OF SURGERY

VOL XXXIX

JUNE, 1904

No 6

ORIGINAL MEMOIRS.

THE OPERATIVE TREATMENT OF THE HYPERTROPHIED PROSTATE

WITH SPECIAL REFERENCE TO ITS EVOLUTION, PRESENT STATUS, AND THE
CHOICE OF OPERATIVE METHOD AND TECHNIQUE

BY FRANCIS S WATSON, M D ,

OF BOSTON, MASS ,

Lecturer on Genito Urinary Surgery in the Harvard Medical School, Junior Visiting
Surgeon to the Boston City Hospital

THERE are so many modifications and slight changes of technique which are being put forward in the field of the operations for the relief of prostatic hypertrophy under the name of "methods," that it is of some importance to the student who approaches the subject for the first time to know which are the actual methods, which their modifications are, and where they came from. The following very brief sketch is therefore given as a preface to the subject-matter that forms the real body of this communication.

HISTORICAL REVIEW SUMMARY OF OPERATIVE METHODS AND MODIFICATIONS

I Prostatotomy, or division of obstructing portions of the hypertrophied prostate, and partial prostatectomy by excision or partial removal of same

(a) *Through the Urethra*

- 1832 Leroy d'Etiolles 1 Scarification and incision
 (*Comptes Rendus des Séances*, Vol iv, p 551)
 1849 Leroy d'Etiolles 2 Snaring middle lobe By
 ligature cauter per urethram
 1836 Guthrie, the same ("Anatomy and Diseases of
 the Urinary and Sexual Organs," London, 1836, pp 23 and
 25)

These did not come into vogue, and no further progress of importance in the urethral operations was made until they were again advocated in 1856 by Mercier Special instrument, the prototype of Bottini's From Mercier dates the actual beginning of operations seeking to relieve or cure prostatic hypertrophy and its consequences The next step is (1858) by Mercier, who suggests and does excise projecting median enlargements with a special form of prostatectome (*Récherches sur le Traitement des Mal des Org-Urinaires, etc*, 1856, p 209)

1874-77 Bottini introduces galvanocautery treatment by special form of instruments devised by him for the purpose In 1877, galvanocautery incision by another form of instrument

1897 Freudenberg modifies Bottini instrument

1902 Young modifies Freudenberg's instrument by supplying it with blades of different sizes

1904 Tenney exhibits instrument of a new form, allowing in a few cases visual application of cautery to prostatic obstruction At meeting of Surgical Suffolk District Section, Boston, March 2, 1904

(b) *Through the Perineal Urethra*

Prostatotomy, partial prostatectomy, tunnelling median lobe, removal of same by forceps, snare, galvanocautery prostatectomes and incision of by galvanocautery instrument, puncture of by special instrument, etc , also enucleations and removals by *morcellement* through this route

1836 Guthrie (*op cit*) Division of median obstruction through this route

1874-85 Gouley applies Mercier's incision and excision operations through the perineal urethra

1883-84 Harrison advocates incision and tunnelling by the same

1886 Belfield incises with galvanocautery instrument

1888 Watson advocates excisions with galvanocautery prostatectome, and presents specially devised instrument for the purpose to be used through this or the suprapubic route

1890 Wishard punctures with galvanocautery instrument

1892 Norton presents a modified Mercier prostatectome to be used through this route

1901 Chetwood presents a galvanocautery incisor to be used through the same route

THE PERINEAL RADICAL OPERATIONS

Enucleations and Morcellements, Total Extirpations through Various Perineal Incisions and by Variations in Technique

Throughout the last century, surgeons in doing one or another of the perineal lithotomy operations have twisted, or bitten off, or enucleated with the finger obstructing masses of the hypertrophied prostate. These removals were infrequent, most of them were accidental, the rest incidental to, but intentionally done in course of the stone operations. So far as I can learn, the first deliberately planned removal of the prostate was done in 1867, when Billroth removed the whole gland for malignant disease through a median perineal incision, taking it away piecemeal. The fact of the malignant disease and not hypertrophy, does not seem to affect the character of the technical conception or the execution of the operation.

1870 Sir William Fergusson (London *Lancet*, January 1, 1870,), in the course of a lateral lithotomy enucleates a mass from hypertrophied prostate. He refers to the fact thus

"I have ventured to put on record what some of my professional brethren may have hesitated to do, from fear that they may have been

guilty in performing their operations of perpetrating some rough mechanism not in accord with that nicety of manipulation which is thought so essential in the performance of the master handiwork in surgery,—lithotomy”

A complete and perfect recovery followed this operation

1873 Gouley (“Diseases of the Urinary Organs,” by Dr J W S Gouley, New York, 1873)

Gouley gives deliberately and clearly a formulated plan for the removal of the entire gland from the perineum, and, so far as I have found, is the first one to do so. He says

“The surgeon should endeavor to give permanent relief by a procedure which will not add greatly to the dangers of the preceding steps (He has been describing a median perineal removal of the middle lobe) He should first explore the prostate through the artificial opening (external perineal urethrotomy), and if he should discover a median outgrowth, or isolated tumors, he should dilate the prostatic sinus, or incise the prostate laterally, and enucleate the lateral tumors, or, if there be a median outgrowth, excise it, but the better plan is to remove the latter by means of a small wire ecraseur, and then to introduce a large-sized, soft, vulcanized, India-rubber catheter, and retain it in position for two or three days”

1878 Bickersteth removes by enucleation in course of bilateral lithotomy a mass the size of a hen’s egg from hypertrophied gland

1881 Harrison repeats this experience by a similar operation (“Surgical Disorders of the Urinary Organs,” 1887, Third Edition), and definitely advocates, as did Gouley, the systematic removal of the obstructing masses

1882 Leisrunk (*Arch für klin Chir*, 1882, Berlin, xxviii, p 578) does the first total extirpation, *en masse*, of the prostate, together with the prostatic urethra, for malignant disease of the gland, removing it through the crescentic, transverse, perineal incision of Celsus passing across the anterior margin of the anus. He approached and exposed the gland by blunt dissection, and removed it entire, together with the prostatic urethra, cutting the distal and proximal parts of the latter across. He succeeded in uniting the divided ends of the

urethra by suture The disease of the prostate was malignant, but the operation in its essential features and conception was that which has been from time to time reproduced under other names The incision is, of course, that introduced nearly 2000 years ago by Celsus in his operation for the removal of stone, known as "cutting on the gripe" Leisink's patient made an operative recovery

The above may be considered as the tentative period of the operative treatment of prostatic hypertrophy by the urethral and the perineal methods, comprising a good many isolated instances of radical removals of the hypertrophied parts of the gland Its interesting feature is that so many surgeons should have demonstrated the remarkably successful results of such procedures as well as their feasibility, and that their systematic practice should have been urged by three such able and widely known advocates as Gouley, Harrison, and Bottini without attracting more attention to the possibilities which they suggested to relieve this distressing malady In consequence of the unwillingness of the profession to embark upon an extended trial of these operations, they had not then been done in sufficiently large numbers to allow us to utilize them as data from which to draw inferences that were at all authoritative

1888 Watson demonstrates that in two-thirds of all cases the part or whole of the obstructing hypertrophies can be removed through the perineal route One-third cannot, and urges again the proposition of Gouley, and also that the radical removals be more frequently undertaken Advocates perineal route when possible, and when not, the suprapubic for the purpose, and perineal urethrotomy incision to explore, as first step in all cases

1889 Zuckerkandl introduces an operation the essentials of which are those of Leisink's operation

1890 Dittel proposes a distinctly different incision of approach, viz, by a lateral incision extending from tip of coccyx to midpoint of the perineum, passing around one side of the anus And that a wedge-shaped piece be taken from the posterior aspect of each lateral hypertrophy instead of removing the whole gland

1890 Goodfellow begins systematic enucleation of the gland through perineal median urethrotomy incision

1892 Pyle introduces similar operations

1891 Wishard carries out Gouley's suggestion of intra-urethral incisions and enucleation

1895 Morris describes perineal method of removing the gland through a median incision not entering the urethra, and by incising the capsule of the gland in middle line and enucleating with finger or blunt dissector or by other appropriate instrument subcapsularly, very much in the same way as that described by some of the French surgeons in 1900 *et seq*

In 1901, and the succeeding years between that one and the present time, various forms of "prostatic tractors," or, as the French term them, "desenclaveurs" have been introduced for the purpose of facilitating the performance of the removal of the gland in the perineal operations by pulling it towards the surface and holding it steady during the manipulations practised in the removal. These instruments are as follows

1901 Albarran introduces a two-bladed desenclaveur, which is passed into the bladder through a median perineal urethral incision, the two blades being closed together, the latter are then separated by a mechanism in the handle's outer end, and traction is exercised by them upon the posterior surface of the intravesical portions of the hypertrophied gland. Albarran subsequently abandoned the use of this instrument

1902 Parker Syme introduces a rubber balloon attached to the end of a handle. The balloon is passed into the bladder through the same channel as the last-named instrument, is then inflated with water, and traction is exercised upon the posterior aspect of the intravesical parts of the prostate by drawing upon the handle

1903 Lydston introduces another form of branched tractor

1902 Delbet (*Compte rendu de l'Assoc Française d'Urologie*) introduces a single-bladed tractor. The blade is closed against the corresponding part of the instrument when introduced, then deflected into position

1902 De Pezzer (*Ibid*) A two-bladed tractor, to be used after the same manner as that described in connection with Albarran's instrument

1902 De Pezzer (*Ibid*) A combined tractor and galvanocautery incisor

1902 Legueu introduces a double-bladed tractor (*Ibid*)

1903 Young introduces a two-bladed tractor used in similar manner to that already described in connection with other similar instruments (June, 1903, published and illustrated in the *Journal of the American Medical Association*, October, 1903.)

Other means of accomplishing the result of bringing the gland within reach in the performance of the perineal operations and of holding it firmly in that position have been numerous. Thus the way most frequently practised, and which has been in vogue by many surgeons for a long while in the performance of the perineal operations, has been to have recourse to the manœuvres employed in the classic operation of Celsus when cutting for stone from the perineum, and called "cutting on the gripe," namely, to hook down the prostate by the tips of two fingers passed into the rectum, and again by pressing down by the hand upon the abdomen immediately above the symphysis pubis, as advocated by Sir Henry Thompson in connection with digital exploration of the bladder in 1884. Guiteras in 1900 proposed to modify the suprapubic pressure by making it more directly applicable by means of an incision above the symphysis pubis down to but not into the bladder.

Still other means of making the gland accessible are the following:

1901 Albarran (*Compte rendu de l'Assoc Française d'Urologie*, 1901) by the finger-tip introduced through a median perineal incision, and again by traction upon the cut edges of the capsule after it has been divided upon its posterior surface in performing the perineal operation as done in his manner of doing the operation.

1902 Murphy introduces hooks for the purpose of drawing down the gland.

In 1901 to 1903 and 1904 a variety of mechanical aids have been proposed to aid in the performance of the perineal operations. Thus

1901 Albarran (*Compte rendu de l'Assoc Française d'Urologie*, 1901) introduces retractors for opening the outer incision and giving a wide field in which to operate. In connection with one of them, he uses an adjustable blade which passes beneath the coccyx and part of the sacrum, and fixes the blade of the retractor which lies within the wound between the rectum and the prostate, and thus does away with the need of an assistant's hand to hold it in position.

1901 Pioussé (*Compte rendu de l'Assoc Française d'Urologie*, 1901) introduces a frame by which the patient is held in a position similar to that gained by the use of the Trendelenburg table, but in addition to that position the patient's legs are spread apart and held attached to two uprights, thus giving free access to the perineum and having the pelvis tilted high in the air at the same time.

1902 Delbet (*Assoc Française d'Urologie*, 1902). A similar device for separating the wound's edges, and giving free operative field by means of a retractor having two blades, and a sacral branch to fix it and retain it in place, in a similar way to that employed by Albarran.

1902 Louveau (*Assoc Française d'Urologie*, 1902) introduces another *porte jambe* device for placing the pelvis high and holding the legs. Also blunt dissectors and special forms of needles attachable to handle.

Between 1900 and 1904 there have been a number of carefully and accurately described manners of removing the gland from the perineum. In the main these operations are very similar. They differ in respect to minor detail. They have emanated chiefly from the French surgeons, beginning with Albarran in 1901. In America, in 1903, Young, of Baltimore, describes a similar manner of doing a perineal operation to those which have been devised in France.

The modern operations now coming into wider use seem to have been planned carefully by their advocates, but as a matter of fact they are all in the essential factor of the re-

removal of the gland to be credited to Gouley, Leisrink, Billroth, later to Morris, whose description in 1895 is very close to that of some of the most recent perineal ways of doing the operation, and again Pyle and Zuckerkandl, in 1889 and 1892, trace most of the essential steps of these later methods

The details of the following ways of doing the perineal operations will be found by consulting the articles referred to

1901 Albarran describes his manner of removing the gland through a median capsular incision aided by the finger in the prostatic urethra used as a tractor, and the removal being effected by taking away the lobes a part at a time (*Compte rendu de l'Assoc Française d'Urologie*, 1901)

1901 Proust (*Compte rendu de l'Assoc Française d'Urologie*, 1901) describes a similar method of doing the perineal operation Effects removal of gland lobe by lobe entire

1902 (*Compte rendu de l'Assoc Française d'Urologie*, 1902) Similar operations are here described and illustrated by Hartmann, Legueu, Proust and Gosset, Pousson, Reynes, Le Fur, Escat, Loumeau, Dorst, and numerous cases are reported Albarran gives the results, both immediate and remote, of his operations performed up to that time

1903 Young (*Journal of the American Medical Association*, October 24, 1903) describes and illustrates a similar manner of operating to those referred to just above

1902 Rydygier describes a similar manner to the above of doing the perineal operation, the point made by him being that of saving the prostatic urethra by means of clamping off with strong forceps the part of the lateral lobes lying adjacent to the urethra, after separating the other portions of each lobe in turn from the capsule of the gland by enucleation with the finger

SUPRAPUBIC RADICAL OPERATIONS

1827 Amussat removed the middle lobe with scissors by this route

1880 to 1887 the operation was performed by Dittel Trendelenburg, Belfield, Benno Schmidt, and McGill

1887, *et seq*, ably advocated and performed by McGill, of Leeds, England, to whom it chiefly owes its adoption and extended use. McGill enucleated the entire gland in two or more masses, describing its exposure through the intravesical covering over its surface. To Belfield and McGill the method properly should be credited.

1895 Fuller suggests counterpressure upon the perineum to bring the gland more easily in reach, and also to make perineal urethrotomy incision for drainage afterwards.

1899 Guiteras suggests the manœuvre of Pierre Franco for lifting up the bladder (utilized by the latter in suprapubic lithotomy and introduced by him about 1560) by pressure upward with two fingers in the rectum and by the thumb on the perineal surface.

1901, *et seq*, Freyer advocates removal of whole gland in one mass from above symphysis instead of in two or more masses, and claims to do this without injuring or removing the prostatic urethra. Later says that removal of the prostatic urethra with the gland is not harmful.

COMBINED OPERATION

1889 Belfield

1894 Nicoll, through lateral perpendicular incisions through perineum, parallel with and not opening urethra, or median incision according to circumstances, enucleation aided by downward pressure from above through a suprapubic cystotomy incision, bladder covering of hypertrophied gland not opened, and urethra not injured.

1896 Alexander modifies by enucleating from within the prostatic urethra through median perineal urethrotomy incision, as suggested by Gouley in connection with perineal operation aids in the removal by downward pressure through suprapubic cystotomy incision. The enucleated masses are removed through the perineal cut.

1899 Bryson suggests suprapubic counterpressure from above the symphysis through an incision down to but not into bladder.

1901 Guiteras suggests the same manœuvre Bouffleur repeats Watson's suggestion to remove obstructing masses by this route by galvanocautery prostatectome

INDIRECT OPERATIONS

Castration—1893 J Wm White (ANNALS OF SURGERY, August, 1893)

Ligation of the Vasa Deferentia—1894 Mears, Bruns, etc

Vasectomy—1893 Harrison, etc

Angioneurectomy—1895 Albarran, etc

Ligation of the Internal Iliac Arteries—1895 Bier

Prostatopexy—1902 Delageniere (Fixation of the gland in a new position after freeing it by incision, and dislocation of its lobes downward)

Raising the Level of the Bas Fond—1902 Hawley proposes reduction of the elevated neck of the bladder by incision of the posterior surface of the sheath of the gland, and after partially freeing the latter with the finger over its posterior aspect to excise portions of the gland from that part of it (From the description, the operation seems to differ but very little from that of Dittel, except with respect to the form of the outer incision)

1902 The Infrapubic Operation—Andrews By division of the puboprostatic ligament and the levator ani on one side, and resection of a part of the prostate above the urethra

For the sake of convenience, the evolution of the operative treatment of the hypertrophied prostate may be divided into two periods,—the first being that which precedes 1890, and the second that which is subsequent to it. The former may be considered as the tentative or early part of its development, the latter as that of its activity and its establishment among legitimate surgical procedures

It is not unprofitable to review very briefly the steps that characterize these two periods. The first goes back to the early part of the last century, and until 1856 may be said to have been marked by a few suggestions put forward tenta-

tively, and looking to the performance of partial removals or incisions of the obstructing parts of the hypertrophied gland, and by the performance and reports of a few isolated operations in which a part of the gland was enucleated, or resected, or torn off, usually by accident in the course of the performance of lithotomies

The first persistent advocate came to view in the person of Mercier in 1856, with whom the operative treatment practically speaking originated (See historical summary) The prostatotomy and resections of the middle lobe or of a bar at the neck of the bladder practised by Mercier through the urethra from the meatus were not, however, favored in France or elsewhere It is chiefly to Gouley, of New York, and to Bottini, in Italy, that we owe the revival of interest in the subject, and I think it may be said perhaps the subsequent extension and progress also that have taken place since 1870, at which time there was no operative treatment of this condition in actual use To Gouley is to be referred the first definitely proposed plan and clearly described method for total removal of the hypertrophied gland through the perineal route (See historical summary) To Bottini's frequent and earnest advocacy of his operation is due the preservation of the urethral operation of Mercier under a modified form

One important step had been taken before this, however, namely, an operation for total extirpation of the gland for malignant disease through a median perineal incision and by *moicellement*, performed by Billroth in 1867 Another still more important one, but subsequent to Gouley's and Bottini's work, was the total extirpation of the gland for malignant disease through the transverse incision of Celsus in the perineum, and by enucleation of it in one mass together with the prostatic urethra, the divided ends of the urethra being united by suture, and the patient making a good operative recovery This was done by Leisrunk in 1882

The next push in the right direction came from Reginald Harrison in 1884 (See historical summary) A most important step in advance was next made by Belfield with regard

to the suprapubic operation, and still more so by its being launched into favor and in the form of a more complete operation by McGill, of Leeds, under whose name it is or was, and should be, I think, known Atkinson, Jessop, Mayo Robson, and Mansell Moullin quickly became advocates of this method and supporters of McGill's views This was in 1887 At that time all radical operations were opposed by three very eminent authorities, viz, Sir Henry Thompson in England, Guyon in France, and Socin in Germany

Maintaining the opposite opinion was the small number of surgeons named above, with these the writer associated himself, in 1888, by the publication of a monograph, in which he undertook to establish and demonstrate the following things

- 1 That the advocates of the operative treatment in appropriate cases were right, and that those who opposed its application under *all* circumstances were mistaken in their opinions

- 2 That no underlying rationale upon which to rest the choice of operation in individual cases had as yet been set forth by the advocates of the operative treatment, whose views as to the main issue he shared

- 3 That a rational plan of action in this respect based upon scientific data could be furnished, and to do this was stated to be one of the principal objects of the work, and was undertaken by means of an anatomical and pathological study of the actual conditions presented by the various forms and characters assumed by the hypertrophied gland

- 4 That the local conditions presented by the hypertrophied gland in individual cases should be one of the important elements in determining the choice of operation

- 5 That two-thirds of all prostatic hypertrophies could be reached through the perineum, and either partly or *wholly removed through that route*

- 6 That the remaining third could not, but could be removed through the suprapubic operation

- 7 That the best way of determining whether they could or could not was by digital exploration through an external perineal urethrotomy incision made as the *first step* in all cases in which operation had been decided upon

8 That, according to what was found to be the condition by this means, the operator should complete the operation through that channel, or by a suprapubic cystotomy, with the immediate performance of which the fact of having already made the trifling perineal urethrotomy opening in nowise interfered, while it *did* possess the advantage when it was found necessary to do the high operation of supplying better drainage in connection with it

9 That when the perineal removal could be accomplished, it was the best one of the two to select, inasmuch as it was the safer

10 The mortality of radical operations was shown to be at least 16 per cent The writer claimed that catheter treatment would show at least as high mortality as that of the operative treatment if the comparison were made of the two with patients who were in the same condition in each respectively

11 That, unfavorable as the showing for the operative treatment was at that moment, with respect to mortality as judged by the meagre clinical data at hand, its improvement might be confidently expected

12 That in the palliative suprapubic drainage operations, it was much safer to do a free cystotomy than to introduce a soft rubber drain through a cannula of a large trocar by which the bladder had been punctured for the purpose of inserting such a drain

Partial prostatectomy through the perineal urethral incision or a suprapubic cystotomy was proposed by the writer by means of a galvanocautery prostatectome devised by him for the purpose, as a desirable method of dealing with some cases of middle lobe enlargement (This idea has been reproduced several times since, and various forms of instruments have been devised for the purpose See historical summary)

Since that time the writer has been accumulating personal experience and studying that of others, and it now appears to him that we have reached a point at which we can profitably "take account of stock," so to speak, and this is one of the principal motives for the publication of this communication

The Second or Active Period

What has happened since 1890? Briefly stated, this The establishment of the operative treatment and disappearance of the opposition to it which existed then That is to say, time and experience have amply justified the views of its former advocates

To what has this been due? To the lowering of the mortality that was formerly associated with the radical operations by from one-half to two-thirds of its former percentage, and to the better character of results What has this been owing to? Chiefly to improved technique, especially in connection with the perineal operations, and in a less degree to a better selection of cases for the application of the operations, and knowledge of the circumstances which are suitable to their performance

The more important steps and changes observed in the progress of the operative treatment have been as follows

The introduction of the indirect operations of castration and vasectomy, their rapid rise into favor and their recent decline The high mortality which attaches to the former, in which there has been no diminution, is the chief reason for its present loss of popularity With vasectomy, it is the uncertainty and relatively small number of good results that have done the same for it

A most important change has been in the substitution, as a routine practice, of the total removals of the gland for the partial removals that were at first generally done

The combined operation grew greatly in favor about half-way in this period, but has lost ground very much because of improvements in the performance of the perineal operation, which have made it unnecessary

In 1897, the Bottini operation, which had lagged behind the rest, came to the fore again, owing to the repeated and able advocacy of Freudenberg and to some modifications in the instrument and technique It gained a foothold in France and America, but has been in the hands of a comparatively small number of operators At the present moment its popularity

has begun to grow less in France, and in some degree, also, in America. In England it has been but little employed.

The most noticeable feature within the last four years is the remarkable manner in which the perineal operations have gained ground, especially here and in France, where it appears to be regarded as a new experience by a number of surgeons. In England the suprapubic operation has taken a fresh start because of the discussions provoked by Mr Feyer.

Having outlined the steps taken in the development of the operative treatment, we can now pass to the consideration of the

CHOICE OF OPERATION

No one method has established an exclusive monopoly in the field of operations for the relief of prostatic hypertrophy. There have been a number eliminated from it or are on the way to it, and at the end of twenty years' experience we are left with those with which we began, and may regard the choice as being limited to the following:

- 1 The palliative operations of perineal and suprapubic drainage
- 2 The Bottini
- 3 The total removal of the hypertrophied lobes by the perineal operations
- 4 The same by the suprapubic and the combined operation *

* The high mortality attending the performance of castration, together with the inability to foretell which cases are likely to yield favorable results, and, finally, the uncertainty and relatively small proportion of cures attending this operation, have caused the loss of popularity which for a time it enjoyed after its introduction. That absolute and permanent cures have resulted from it no one doubts. We have all seen them, and the improvement in the condition of the patients in some cases was so sudden and so remarkable as to be scarcely credible to those who performed the operations. It was on this account eagerly welcomed, for no one suspected that so simple an operation would be found to be attended by the late mortality which Cabot and subsequently others showed it to have. I have not included it in the consideration of the choice of operations for the above reasons. Vasectomy has had some very strong supporters, among them Reginald Harrison, than whom it is difficult to find a safer guide as a rule. In this instance I am constrained to make an

Palliative Operations—These are used as, 1 Operations of necessity, 2 As preparatory steps to more radical measures, 3 To relieve suffering, 4 In the hope of restoring voluntary miction by long-continued pressure and distention of the prostatic urethra

(1) In the presence of any of the following conditions, one or another of these operations is necessitated, and is the only means open to us wherewith to afford relief

A patient who is obviously too much prostrated to support any operation other than one of the slightest kind, and at the same time has one or another of the following conditions Retention when no instrument can be passed into the bladder, intravesical hæmorrhage which cannot be controlled by ordinary means, ropy purulent urine that will not run through a catheter, ulcerated surface or condition of any sort that makes catheterization too painful to be used, necessity of catheterization so often that patient becomes exhausted from lack of sleep and rest, delirium, during which the patient frequently removes catheter secured in the bladder through the urethra in the ordinary way, or opposes use of the instrument, so that it cannot be passed Under such circumstances something *must* be done, and the only course open to us is to secure the best drainage possible by the least amount of surgical interference, that is to say, by opening the perineal urethra or doing a suprapubic cystotomy under local anæsthesia when possible

exception, being unable to follow him with regard to his favorable view of this operation

So far as we can learn, its performance is attended with quite as high a mortality as that of the Bottini or the perineal radical operations, and it cannot be claimed to secure so large a percentage of *cures* as the latter, at any rate Again, it is not possible to assert in which variety or stage of the disease its benefits, when they do occur, will result from its performance All things considered, therefore, we believe that surgical opinion in this country, which from the first has never favored this method of treatment, has been correct I have included these two procedures in the analyses of the mortality, as I have also done the partial prostatectomies and a number of cases treated by the catheter in order to show upon what ground some of the statements I have made with regard to these operations rest

We should never be deceived into thinking that *suprapubic puncture with a large trocar, and passing through it and securing* in proper position a soft drainage tube, is less dangerous to the patient than making an open incision under these or any circumstances, the writer long ago showed that the reverse was the fact, this is largely owing to the subsequent leakage of urine around the tube so introduced, and septic infection due to it in the prevesical space

(2) Drainage has for a long time been used by some surgeons as a preparatory step to operations of a more radical character. Under its employment, in the fortunate cases, the renal functional capacity will improve, cystitis may be improved or cured, and the general condition of the patient be benefited, owing to the relief from pain and disturbed sleep which may have been present, etc., so that he may perhaps sustain a radical procedure

(3) Very often relief to suffering at any rate will be secured, and the object sought, if that is what it has been, will have been accomplished

(4) The idea of restoring voluntary urination, which has been lost, by means of the expansion of the deep urethra or pressure atrophy of the gland, through the long continued wearing of a catheter, or by letting instruments rest in the deep urethra for a time at intervals, is a very old one in connection with these cases. It is revived from time to time as a new procedure, tried for a while, and relapses into disuse again. That it may temporarily accomplish this object is undoubtedly true. The writer has had it occur in some of his own cases, but that the temporary relief will be maintained is true in so few, if any, cases, that it is not worth seriously considering as a remedial possibility

How valuable long-continued drainage may be, Sir Henry Thompson and many others have demonstrated long ago. In one of Sir Henry's cases the patient remained in perfect comfort with continuous suprapubic drainage for something like fourteen years, and continued an active life during this time. In four of the writer's own cases the same was true, though

for shorter periods, all the patients having been older when the operations were done, and their deaths coming sooner afterwards than in Sir Henry's case,—the longest interval being four years in one instance

Reginald Harrison some years ago drew attention to the benefit that might be derived from the prolonged drainage of the bladder, with respect to the renal function, when the latter was deficient, and the writer has had a number of cases in which its value in this respect was marked

Unless the condition of the kidneys and of the patient generally has been very greatly benefited by the palliative operations, the surgeon will be wise, if he has been able to secure comfort for him, to rest content with what the palliative method has accomplished, and not attempt further and more radical measures

The high mortality associated with the performance of the palliative operations is not to be regarded as referable to the operations *per se*. As we have seen, they are, as a rule, used as a last resort, and when we are obliged to do something because of our inability to employ the ordinary catheter treatment or drainage through the urethra, and when this is the case, we are dealing with the most advanced forms of the disease as a rule, with patients with serious renal lesions and renal insufficiency, who are many of them already near death, and whose death is inevitable, no matter what form of treatment is used

Combined Operation

With regard to this method it may be said that until a few years ago it had the advantage of affording a greater control of the gland for the manipulations necessary for its removal, but this advantage was gained only at the expense of making the suprapubic incision in connection with that in the perineum. In other words, by adding very definitely to the dangers of the operation. This has in the greater number of cases been made unnecessary by the recent adoption of modifications by which the gland is rendered more accessible, and placed under better control in performing the perineal operations alone

This being the case, we may for practical purposes eliminate the combined operation, and are consequently left with the three standard methods, with which we began the modern history of the operative treatment, to choose from, viz, the Bottini, the perineal total removals, the same by the suprapubic operation

The Factors determining the Choice between the Bottini, the Perineal, and the Suprapubic, Complete Operations

The primary factors determining the choice of one or another of several surgical operations all having the same object in view are

- 1 Their relative dangers
- 2 Their relative limitations
- 3 The character of their respective results

Dangers, General and Special—Operative dangers are of two kinds 1 Those to which the patient is exposed in a general way in the performance of one or another kind of operation, and of these we learn something by the study of their respective mortalities as such 2 Those which are in greater or less degree peculiar to each method of operation, and these we learn by a study of the causes of death in the fatal cases attending the performance of each kind of operation

* To determine these and other factors of this problem, I have collected, carefully studied, and analyzed 2627 cases in which various sorts of operations have been done This series is, so far as I am aware, a much larger number than that hitherto presented by any one, and while, of course, it is entirely inadequate as a basis for final conclusions to rest upon, it yet has some value in that it may be taken as a fair representation of the sum total of experience up to the present time with respect to some of the elements entering into the operative treatment of the condition we are discussing

In compiling and analyzing these data with reference to the operative mortality, two months after the operations have been taken as the time within which death can be called operative, and only such fatal cases as those in which death occurred within this period have been included, on the other hand, even within this time, all deaths which were clearly due to other causes than the operations have been excluded Finally, all doubtful cases have been included The statistics have been taken from the reported cases of 100 different operators of various nationalities, and

Method of Treatment	Cases	Deaths	Mortality
By catheterization			
Rovsing	126	10	
Casper	51	3	
Watson	30	3	
	207	16	7.7 per cent
Palliative operations—drainage	146	49	33.0 per cent
Partial prostatectomies	160	22	12.5 per cent
Total removals—perineal	530	33	6.2 per cent
Total removals—suprapubic	243	28	11.3 per cent
Bottini	1086	69	6.3 per cent
Castration	210	34	16.2 per cent
Vasectomy	252	21	8.3 per cent
	2627	256	

The mortality of the perineal and the Bottini operations is practically the same, and both are decidedly lower than that of any other method, so far, therefore, as this factor is concerned, the choice would fall to the former two, and they would stand upon equal terms.

Dangers more or less Special to Each Operation, as shown by Analysis of Causes of Death

The four factors—uræmia, sepsis, shock, and pulmonary complications—account for all but a very small number of deaths, and are therefore the only ones included in this analysis.

Bottini	27.0 per cent	} Uræmia (or Renal Insufficiency)
Perineal operations	35.0 per cent	
Suprapubic operations	34.0 per cent	
Bottini	52.0 per cent	} Sepsis
Perineal operations	17.8 per cent	
Suprapubic operations	8.6 per cent	

only such operations as were done since 1890 are included. A list of the authors whose writings supply the data for this communication is appended at the end of it.

Two hundred and seven cases treated by catheterization in the ordinary way have been added for the sake of comparing the results of operative with catheter treatment, so far as may be possible. Only those cases have been included in this 207 in which death followed the beginning of the use of the catheter within the period of two months, that is to say, within the time in which deaths may be regarded as directly due to operation in the operative cases. This is in order to put the catheter cases upon the same plane, for comparison, as the operated cases.

Bottini	5 0 per cent	} Shock
Perineal operations	21 4 per cent	
Suprapubic operations	30 0 per cent	
Bottini	8 0 per cent	} Postoperative Pulmonary Complications
Perineal operations	17 8 per cent	
Suprapubic operations	22 0 per cent	

Uæmia, or renal insufficiency, is, as we know, the danger which is the most serious of all in connection with these prostatic operations, but there is not enough difference in the degree in which it affects the mortality of one as compared with another of these three methods to give it value in the choice between them, it is an aid rather to determining whether any or no operations shall be done, and in this respect is of great importance

So far as is shown by the above analysis of the causes of death, the largest share of danger from sepsis belongs to the Bottini operation. While it has a minimal proportion from shock and postoperative pulmonary complications, the contrary is the case with the two other methods. The suprapubic carries with it the greatest risk from shock and pulmonary complications

There were only ninety out of the total number of 130 deaths occurring in connection with these operations in which the causes of death are specifically stated. That number therefore forms the basis of the above computation

It is not without interest to note with regard to their mortality, a few of the best series of consecutive cases reported by individual operators, for the sake of having the opportunity to judge of each of the methods at its best. The following are given with this intention

The Bottini Operation

	Cases	Death	Mortality
Horwitz	33	0	
Freudenberg	25	0	
Young	41	3	
Bangs	34	3	
	<hr/> 133	<hr/> 6	4 5 per cent

Perineal Total Removal

	Cases	Death	Mortality
Goodfellow	74	2	
Albarran	59	2	
Proust	30	0	
Pauchet	20	1	
Rafin	20	1	
	203	6	2.9 per cent

Suprapubic

Freyer	45	5	
Moynihan	12	1	
Mayo Robson	12	0	
	69	6	8.6 per cent

These figures may be taken as the best showing that can fairly be made for the three operations respectively. In these special series the greatest relative divergence from the average mortality given in connection with the total number of cases is shown in that of the percentage of the perineal operations, in which there is a difference of 3.2 per cent better than the average. In the suprapubic there is 2.9 per cent betterment, and in the Bottini, 1.8 per cent.

CASES TREATED OPERATIVELY BY THE WRITER BETWEEN 1886 AND 1904

By Suprapubic or Perineal	Cases	Deaths	Causes of Death
Drainage	14	2	Both from uræmia
Perineal prostatotomy	4	0	
Partial prostatectomy			
Perineal	2		Uræmia
Suprapubic	3	1	
Total removals			
Perineal	14	2	1, pulmonary embolism, 1, pneumonia
Suprapubic	8	2	1, shock and hæmorrhage (not properly operative), 1, uræmia
Combined operations	12	2	1, pulmonary embolism, 1, shock and hæmorrhage (Second case not properly an operative death)
Bottini's cauterization	4	0	Acute delirium
Bottini's incision	1	0	
Castration	6	1	
	68	10	

In neither of the two fatal cases treated by drainage can the result be properly attributed to the operation. In both the patients were in desperate and hopeless conditions when first seen by me. In one the patient, almost moribund, had complete retention, and no instrument could be passed into the bladder.

The second patient was in an almost equally desperate state, and it was impossible to catheterize him in the ordinary manner. Both deaths occurred from progressive uræmia, already far advanced, and a few hours after the trivial drainage operation had been done under local anæsthesia.

Two other deaths, one following total removal by the suprapubic, and one the same by the combined operation, should not be reckoned as due to operation. In neither case was the removal of the gland contemplated when the operations were begun. In both it became necessary in order to arrest serious hæmorrhage which had been produced by a number of false passages, in one case supplemented by numerous perforations of the bladder, prostate, and the peritoneum by a large trocar, and in the other case the false passages being made from the urethra by metal catheter in attempting to enter the bladder before I saw either of the patients. Both these patients died as the result of what had been done before the operations, and not in consequence of them.

With these four cases counted out, the mortality percentage of the whole series falls to 88 per cent, and makes the mortality attending the total removals by the three methods which were thirty-four cases, 11.7 per cent.¹

Causes of Death—Including all the fatal cases in the writer's series, the causes of death are as follows: Uræmia, 4, shock and hæmorrhage, 2, pulmonary embolism, 2, pneumonia, 1, acute delirium, 1, total, 10.

Immediate results in fifty-eight cases surviving

* Since preparing this paper, two more total removals by perineal operation have been done, both patients recovering with good immediate results. The total number of complete operations is then thirty-six, with mortality of 11.1 per cent.

Regarding the immediate results as being represented by the patient's condition at the time of discharge at completion of convalescence, and classing them under the headings, Wholly relieved, Improved, and Failed, the following results are shown for the writer's series

Wholly relieved, twenty-nine patients The operations done for these patients were as follows

Partial operations	0
Perineal prostatotomy	1
Bottini's operation	1
Castration	3
	<hr/>
	5

Total removals of the hypertrophied gland in which immediate result was complete relief were twenty-four in number The operations done were as follows

Perineal prostatectomy	10
Suprapubic prostatectomy	5
Combined operation	9
	<hr/>
	24

Improved —Seventeen cases were improved as the immediate result of the operation The operations were as follows

Suprapubic drainage	4
Perineal drainage	4
Perineal prostatotomy	4
Partial suprapubic prostatectomy	2
Total perineal prostatectomy	2
Combined total removal	1
	<hr/>
	17

Of the total number of fifty-eight cases 79.3 per cent may be classed as "good results"

Failures

Castration	2
Perineal drainage	6
Perineal prostatotomy	2
Unchanged	2
	<hr/>
	12

Late results of the author's operations For judging of the late results, there are twenty-four, out of the total fifty-eight patients who survived operation, available The late results in these were observed for periods from six months to six years subsequent to operation, and are as follows

Cured, eleven cases

Times observed	Cases	Operations
6 months	1	Perineal partial prostatectomy
1 year	1	Castration
2 years	1	Combined operation, total removal
3 years	1	Perineal total removal
3½ years	1	Perineal total removal
4 years	1	Perineal total removal
4 years	1	Combined operation, total removal
4 years	1	Perineal drainage
5 years	1	Combined operation, total removal
6 years	1	Suprapubic total removal
1 year	1	Suprapubic total removal
	<hr/> 11	

Greatly improved, ten cases

Times observed	Cases	Operations
6 months	1	Partial perineal prostatectomy
8 months	1	Perineal prostatotomy
1 year	1	Perineal prostatotomy
1 year	1	Perineal drainage
1 year	1	Combined operation, total removal
1½ years	1	Perineal total removal
1½ years	1	Suprapubic total removal
2 years	1	Perineal drainage
3 years	1	Suprapubic total removal
4 years	1	Suprapubic partial prostatectomy
	<hr/> 10	

Failures, three cases

Times observed	Cases	Operations
6 months	1	Total perineal removal Urethrectal fistula and general condition not improved
6 months	1	Castration
1½ years	1	Perineal prostatotomy
	<hr/> 3	



FIG 1—Extensive enlargement of both lateral and the median lobes. A case illustrating a form of hypertrophy especially inappropriate for the Bottini and perineal operations, and most suitable for the combined or suprapubic. Bladder and prostatic urethra laid open in front (From Watson's Monograph, 1888.)

Of the cases which the writer was enabled to follow as above stated, all but three were "good results"

LIMITATIONS

Bottini's Operation —1 Inability to obtain a good view of the bladder by the cystoscope previous to operation, which is essential to its safe and proper performance

2 Liability of perforating the bladder-wall in cases in which there is a bladder of small capacity

3 Inability to apply the blade to the obstructing parts of the prostate, such as may occur in cases in which there is a very large high reaching third lobe, especially if it be in connection with extensive bilateral hypertrophy, such as is shown in Fig 1

4 Obstruction of the deep urethra such that no instrument can be passed

Perineal Operations —Such forms of hypertrophy as cannot be reached and successfully removed from the perineum, such are those of the median lobe mentioned above (Fig 1)

Suprapubic and Combined Operations —None

RESULTS

The term cure is used in what follows in the sense in which it is applied by Freudenberg to the results of the Bottini operation, viz, "Only those patients should be reckoned cured who can empty the bladder spontaneously, or who have at most a residual urine of not more than fifty cubic centimetres, whose urine is normal, and who can pass it freely and painlessly" To this I would add that this condition should have been maintained for at least six months after operation

It is customary with those reporting Bottini operations to include the patients cured together with those improved under one heading as "good results" For the sake of uniformity and after giving the two kinds of results independently, I have adopted also this usage and applied it to the other methods as well as to the Bottini in making the following analysis

For the purpose of determining the late results of the three methods, there are but 688 cases. These analyzed under the conditions mentioned above are as follows:

	Cases	Cures	Percentage
Bottini	490	149	30.4
Perineal total removals	145	87	60.0
Suprapubic total removals	53	35	66.0

If the "improved" cases be added, we have as "good results" 86.0 per cent, 88.8 per cent, and 90.0 per cent for the same three operations respectively.

Complications, Failures, Accidents attending the Operations—The following complications occurred in connection with the Bottini operation in a series of fifty-nine of his cases reported by Willy Meyer. Perineal abscess followed the operation in four cases, in two it was due to injury of the membranous urethra, in one case recto-urethral fistula, in six cases epididymitis—one of them ending in suppuration, in two cases orchitis—ending in suppuration in one, and gangrene of the testicle in the other. Altogether thirteen, or 22.0 per cent, of the whole number in which there were serious or annoying complications associated with the performance of the operation.

In 13 per cent of the Bottini cases the operations had to be repeated. Incontinence of urine resulted in 2.6 per cent of the Bottini operations. The operation failed in 11.6 per cent of the cases. Of the sixty-nine fatal cases of the Bottini operation, eight were due to perforation of the bladder by the incising blade.

In the Perineal Operations—Twice the peritoneum was opened, one patient died, one recovered. Urethrorectal fistula occurred in 2.7 per cent as result of operation. Incontinence of urine occurred in 3.5 per cent as result of operation. Failures occurred in 7.4 per cent of the operations.

Suprapubic Operations—Suprapubic fistula occurred in 1.0 per cent of the cases, infiltration of urine in the prevesical space in 1.6 per cent, peritonitis in one case, rectum was injured in one case, failure of the operation in 6.7 per cent.

OPERATIVE TECHNIQUE OF THE PERINEAL, SUPRAPUBIC,
AND BOTTINI OPERATIONS

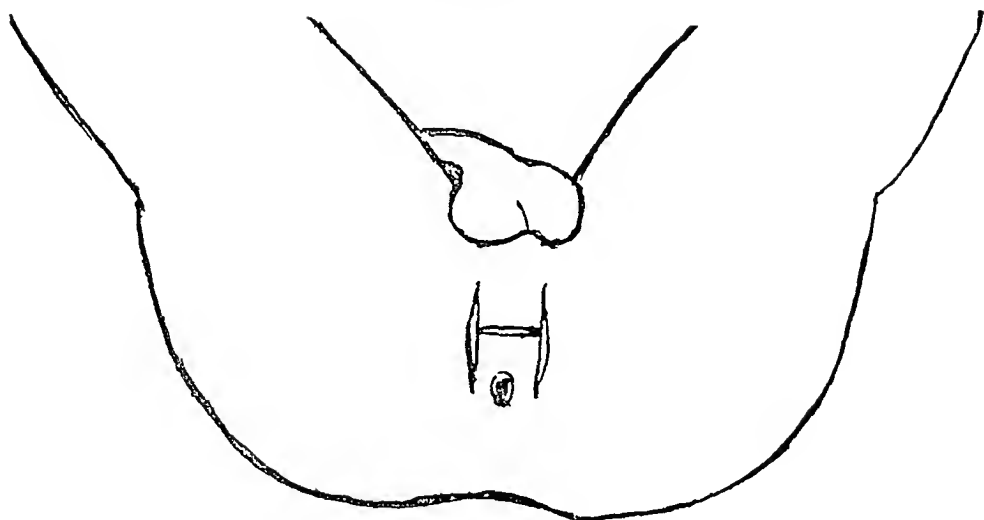
We have thus far been engaged in the study of the evolution of the operative treatment and its clinical features. There remains to be considered the detail of the operative technique of the three methods respectively. It is impossible to give a full description of the different modifications that have one by one been introduced in connection with each of these three operative procedures, without exceeding the proper limits of a magazine article. The reader is therefore referred for the fuller detail of some of them to the writings marked with † in the Bibliographical list at end of article. In the present communication the writer has selected from certain of the published descriptions only what is needed to make clear some of the more important steps as they have been illustrated in the numerous articles above referred to. Some of the latter are apparently not well known in this country, and are very instructive, and the most complete accounts given with respect to the detail of the perineal procedures that have appeared as yet. The last statement applies to the volumes of the annual reports of the communications presented at the meetings of the "Association Française d'Urologie," which represents the work of the most notable surgeons of France in this branch of surgery, and which has been published each year since the first assembly of the Association in 1896, by Octave Doin, 8 Place de l'Odeon, Paris.

Technique of the Perineal Operations

The essentials for the successful performance of the perineal operations are 1 The free exposure of the gland 2 Making the gland accessible, and maintaining it in a fixed position while removing it 3 Avoiding injury to the urinary sphincters 4 Avoiding injury to the rectum 5 Avoiding hæmorrhage 6 Avoiding unnecessary injury to the urethra and ejaculatory ducts

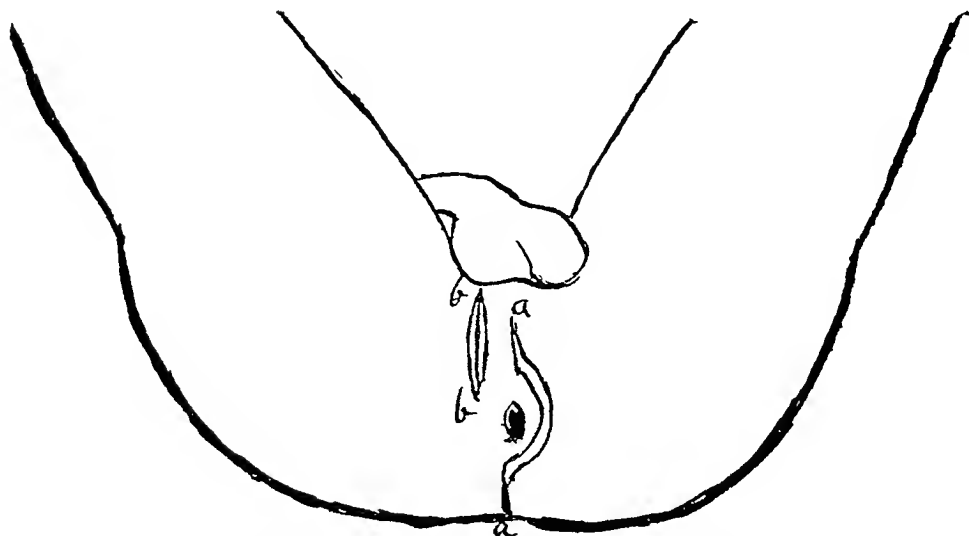
These we will consider in order

DIAGRAM 1



H, Incision suggested by Gerster

DIAGRAM 2



a, a, Dittel's lateral incision

b, b, Nicoll's lateral incision used in connection with combined operation

DIAGRAM 3

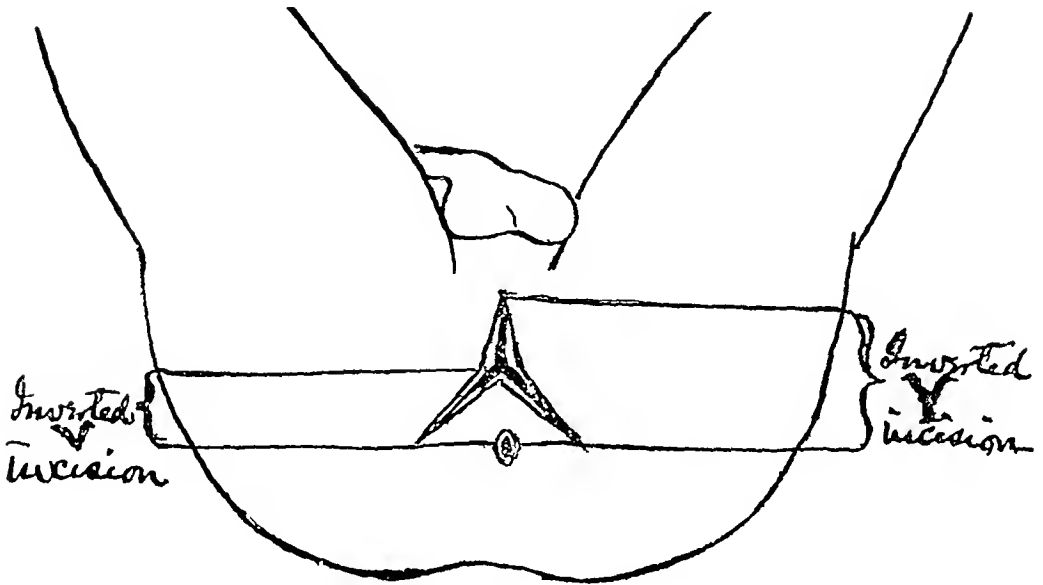
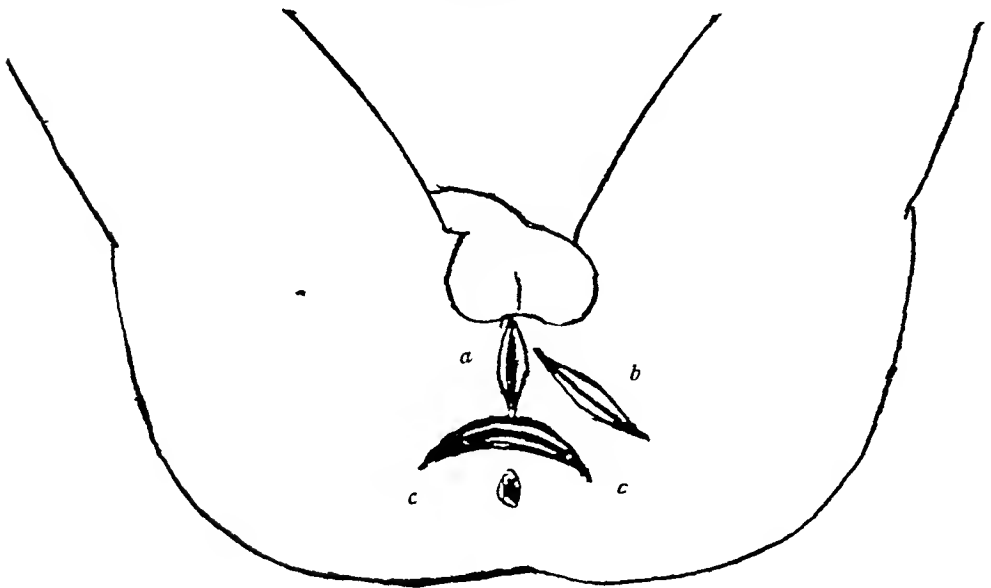


DIAGRAM 4



- a*, Median perineal incision
- b*, Lateral lithotomy incision
- c*, Celsus curved prerectal incision

I *The Incision*

The accompanying diagrams show the various perineal incisions which have been applied, either alone or in connection with the suprapubic operation, for the purpose of removing the gland

That one of these, which allows the freest approach to the gland and the widest avenue for its removal, is naturally the best one, and it is the transverse, curved incision extending from one ischial tuberosity to the other in front of the anterior margin of the anus, in short, the classic lithotomy incision which was introduced by Celsus nearly 2000 years ago and subsequently slightly modified into the inverted V, and still further into the inverted Y incision, which was used by Fergusson, etc., in 1848 in lithotomy operations, and first applied to the removal of the prostate by Leisrink in 1882

This incision, or one of the above modifications of it, will be selected according to the size of the gland and the greater or less amount of room required for its removal

Reaching the Fibrous Sheath, and Exposing It—The key-note to reaching and freely exposing the fibrous sheath through the transverse perineal incisions above referred to, is freeing the rectum from the posterior urethra and prostate. And the way to do it is by transverse division of the tendinous centre of the perineum, and blunt or finger-tip dissection between prostate and rectum until the outer covering of the former is fully exposed over its forward and posterior surfaces (Fig 2)

The means employed for rendering the gland accessible are as follows

For Removal through the Perineum—1 Drawing the gland down by the tips of two fingers passed into the rectum as done by Celsus, in lithotomy operations, to which he gave the name of "cutting on the gripe"

2 Downward pressure from above the symphysis pubis, as taught by Sir Henry Thompson in 1882, in connection with digital exploration of the bladder

3 The same manœuvre carried out through a suprapubic

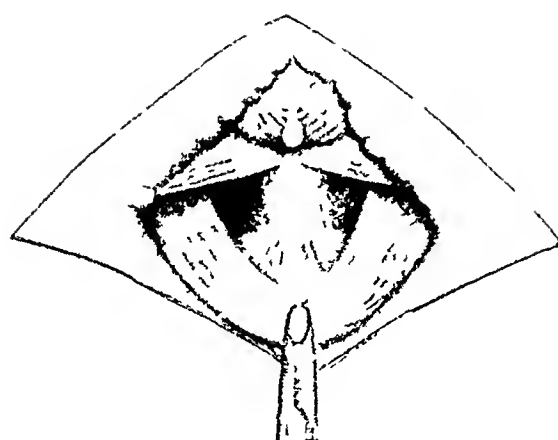
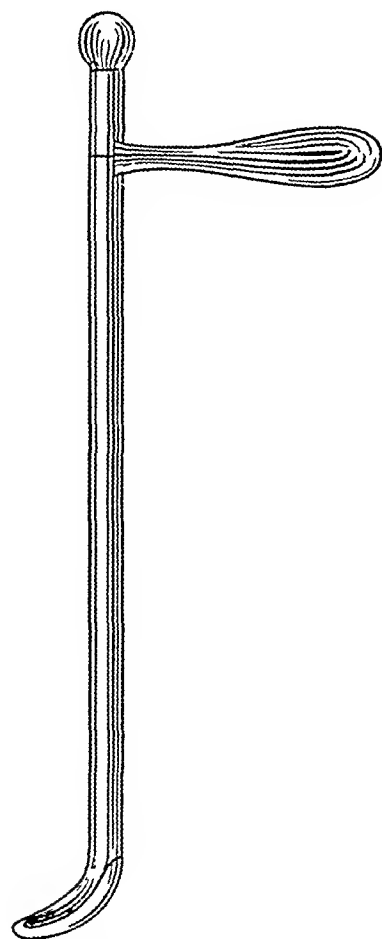


FIG 2.—After division of central tendon Exposure of recto urethralis muscle (Young)

incision down to but not into the bladder, as suggested by Bryson and Guiteras. This procedure does not commend itself except with very fat subjects.

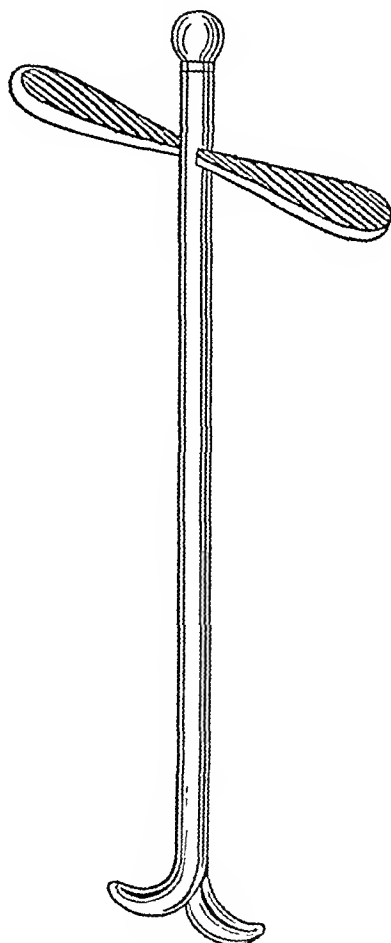
4 By various forms of tractors, the first of which is the two-bladed instrument introduced by Albarran, who, it is to be noted, abandoned it as being unsatisfactory, on the other hand, de Pezzer, who introduced a similar instrument some-

FIG 3



De Pezzer's prostatic tractor, closed

FIG 4

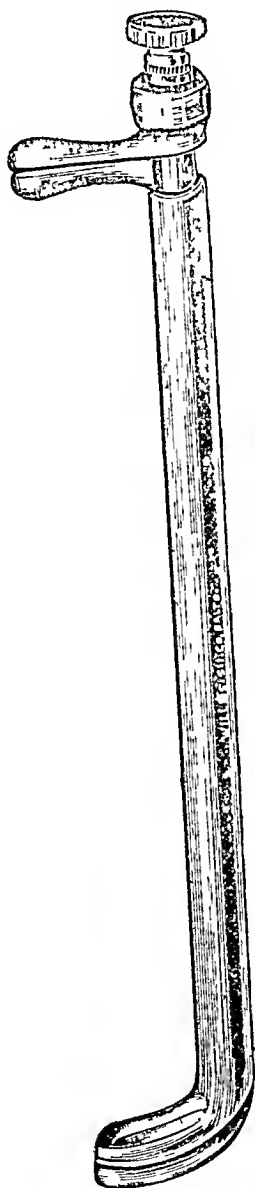


De Pezzer's prostatic tractor, open

what later speaks highly of the advantage to be gained by its use, so, too, does Young, of the instrument of the same character as the two just mentioned, which he introduced in the following year, having independently had the same conception of the form of an instrument that was suitable for the purpose that is embodied in Albarran's and the second of de Pezzer's instruments, the latter of which Young does not appear to have

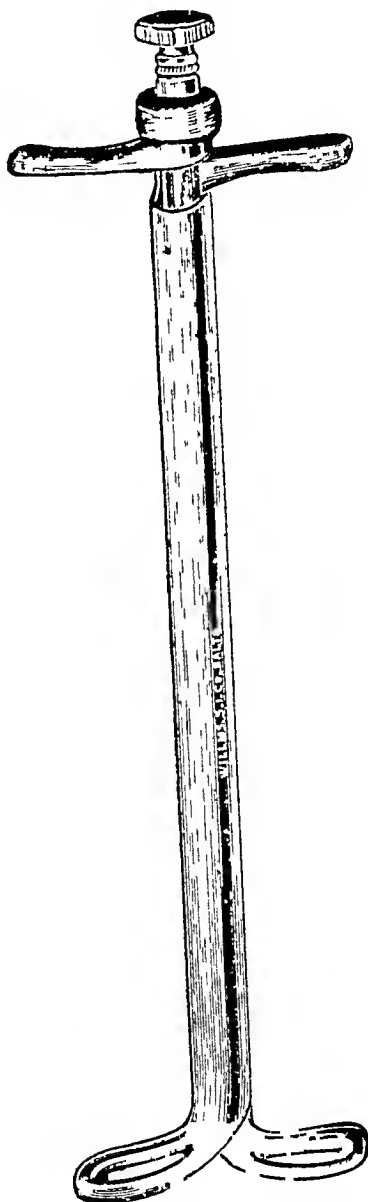
seen (He refers to de Pezzer's combined incisor and tractor, but not to the larger two-bladed instrument which de Pezzer showed at the same time in 1902)

FIG 5



Young's prostatic tractor, closed

FIG 6



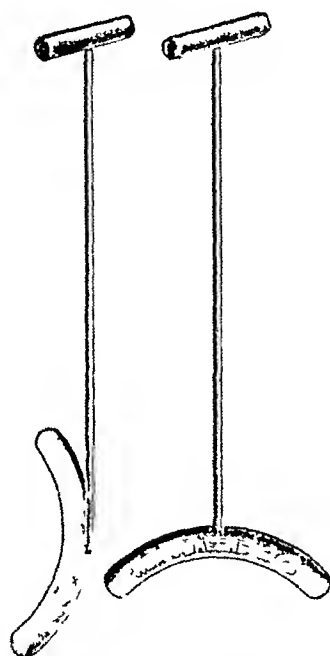
Young's prostatic tractor, open

Other forms of tractors are the rubber inflatable balloon of Parker Syms, presented in 1902, and that of Lydston, and

still another single-branched desenclaveur of Delbet (Figs 3, 4, 5, 6, 7, and 8 illustrate the instruments of de Pezzer, Young, and Lydston respectively) These instruments are all used through a median perineal urethrotomy incision

Of these different means, the writer has found downward suprapubic pressure, downward traction upon the further end of the gland by the tips of two fingers in the rectum, or by the tip of one finger passed through a median incision in the posterior urethra into the bladder and hooking it over the intra-vesical aspects of the lateral lobes, to be amply sufficient in all

FIG 7



Lydston prostatic tractor

but fat subjects These means have the disadvantage of being subject to the limitation just mentioned They have the advantage that is derived from the use of a sensitive instrument, such as is the finger, as compared with all mechanical devices, on the other hand, the mechanical devices are less in the way of the operator than are the hands of the assistant, which may be required for the execution of the manual measures for depressing the gland and holding it in place

The criticism that the writer would make with regard to the tractors having metal arms is this During the early part

of the enucleation there is much aid to be derived from such instruments as those referred to above, but at the time that the greatest pressure is required, which is at the moment when one is separating the distal or intravesical parts of the gland from its coverings,—for they are the farthest away, and consequently the most difficult to reach and work upon, at that time, if a degree of traction is exerted sufficient to bring the gland down, there is some danger of having the metal branches of the instrument within the bladder tear through the latter and the prostatic urethra and the vesical outlet. This happened to the writer on the first occasion of his using Young's instrument. If it be applied in the cadaver, the danger will be seen to be one that is real, and it is well therefore to refer to it, not in disparagement of this, or of other instruments of the sort, but simply to caution those using them for the first time against this possibility of doing injury if care is not taken at the moment referred to above.

Removal of the Gland—The following are the different ways by which the glandular tissue of the hypertrophies has been removed after the prostate is separated from the rectum and exposed.

1 By opening the prostatic urethra from its anterior end through about two-thirds of its length. The forefinger is passed into the urethra through this cut. The lateral aspect of the prostatic urethra is opened about midway in its length on one side sufficiently to admit the tip of the finger. This opening is made through the mucous membrane of the side of the urethra at the point just named, and must divide all the coverings of the gland—which are often nothing more than the mucous membrane here, though in other cases the outer sheath of the gland is well defined—down to its inner thin capsule or to the gland substance itself. The trained finger without the aid of sight can always readily recognize the surface of the gland. The opening through the side of the urethra may be made with the finger-nail, an ivory nail-cleaner, a gum-lancet, sharp-pointed tenotome, or a curved periosteum elevator, as the operator may prefer.



FIG. 8—Showing position of blades in interior of bladder in case of median and bilateral hypertrophy (Young)

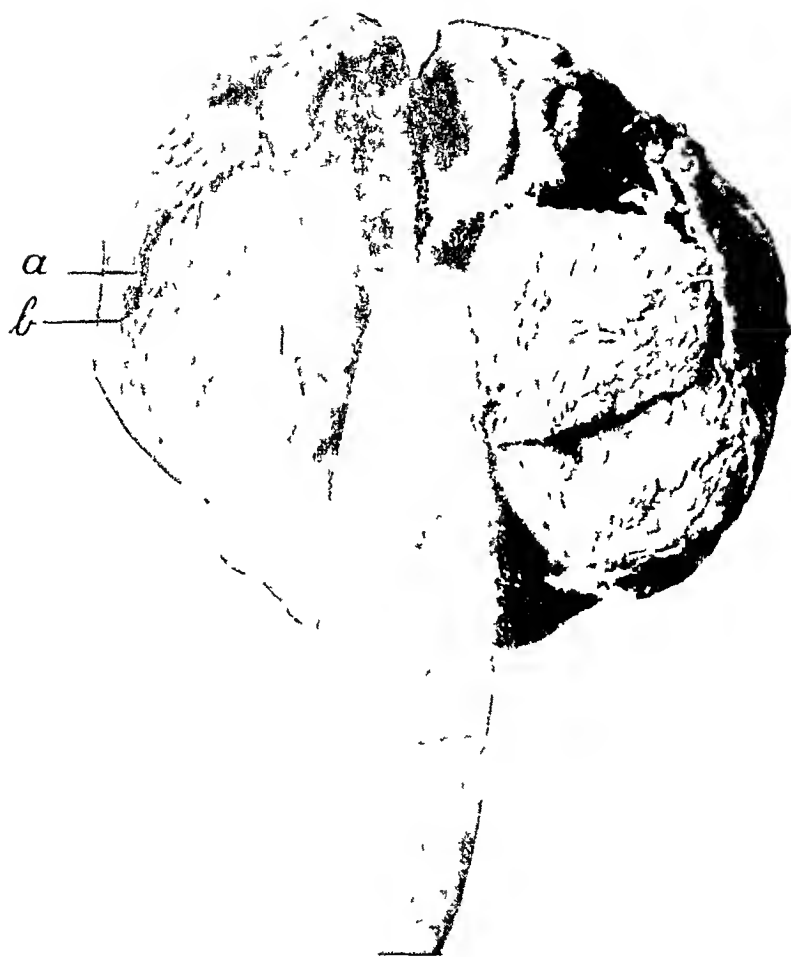


FIG 9—Illustrates the thickness of the outer sheath *a* in which the venous plexus lies, *b* the space between the sheath and the inner capsule where the separation of one from the other takes place when enucleating. The gland has been exposed to view as well as the prostatic urethra by division of its superior aspect in the median line from above and the middle lobe divided to its base in order to give a free view of the parts. The finger-tip is shown in the position taken by it when enucleation is begun from the lateral surface of the prostatic urethra through an external perineal urethrotomy incision. (Author)

The tip of the finger is introduced through the opening thus made and the lobe on that side is enucleated, beginning by separating the glandular mass along its urethral side, then beneath, in front and over the outer lateral aspect, and, finally, from the bladder. The enucleation being always carried on inside the outer capsule or sheath. The thinnest parts of this sheath are found along the urethral side and the bladder side of the gland. It is often absent or very delicate in these places, the mucous membrane alone covering the glandular tissue there.

When the lobe on one side has been separated in this way, it is seized with forceps of appropriate form—the lithotomy forceps used for extracting the stone are convenient ones—and withdrawn through the opening in the urethra. Care should be taken not to attempt the removal of very large masses of the hypertrophied gland through this incision lest the membranous urethra be seriously damaged and incontinence result. In withdrawing the enucleated lobe there is another precaution which should be taken, namely, that of extracting it in an upward direction and of avoiding all downward pressure upon it, for it is in the latter way that the rectum is very likely to be torn through.

Fig. 9 shows the line through which the finger-tip is passed in reaching the gland from the side of the prostatic urethra, and also the space between the gland surface and its outer sheath in which the finger or instrument carries out the enucleation. This is the operation proposed by Gouley in 1879, and is the same with respect to the manner of conducting the enucleation of the gland as that part of the operation of Alexander in 1895, which he executed in connection with a suprapubic incision made for the purpose of depressing the gland, and in order to hold it steady during the enucleation.

2. Proust (1900–1901) varies the operation thus. Exposes the posterior surface of the gland, finds, isolates, ligates, and cuts across the upper ends of the ejaculatory ducts and the accompanying blood-vessels. In doing this he finds

the use of a tractor helpful. He does not describe its form, but illustrates the manner of its use (Fig 10), which, it will be seen, is that in which the instruments subsequently devised by de Pezzer and Young are employed. After the division of the vessels, a part of the sheath of the gland is cut away from the posterior surface of the prostate, the latter, together with the prostatic urethra, is now split in two by a median incision through the posterior surface of the gland (Fig 11). The two lateral lobes are then enucleated, each one entire. The finger is passed into the prostatic urethra and acts as a guide to prevent injury to the latter while the gland is being separated from it along the inner side of each of the lobes in turn. This is the first part of the enucleation, and is accomplished by scissors which cut the gland free where it impinges on the prostatic urethra, the rest of the prostate is separated from its outer sheath by finger-tip or scissors or blunt dissector as occasion demands, and each lobe as it is freed is withdrawn.*

Albarran's manner differs, in that he does not ligate the vessels or ducts, and, after splitting the prostate and prostatic urethra in two in the median line posteriorly, he introduces his forefinger, and begins the enucleation by separating the outer capsule or sheath of the gland from the latter along the line of the incision just mentioned, first with scissors, then with the finger as he proceeds towards the outer lateral aspects of the gland, first on one side and then on the other, until he has cleared about one-half or a little more of the gland from its outer sheath, working between it and the gland surface, then he frees the gland with scissors along its urethral side from the canal of the urethra until he has separated it for about half the length of the latter, at which point in the operation he cuts away the anterior part of the gland which he has freed from its attachments on all sides to that extent, dividing first one lobe across, including perhaps one-

* Proust's manner of performing the operation, which is only outlined here, will be found in very full detail in the *Memoires de l'Association Française d'Urologie*, 1901, Vol v, p 361.

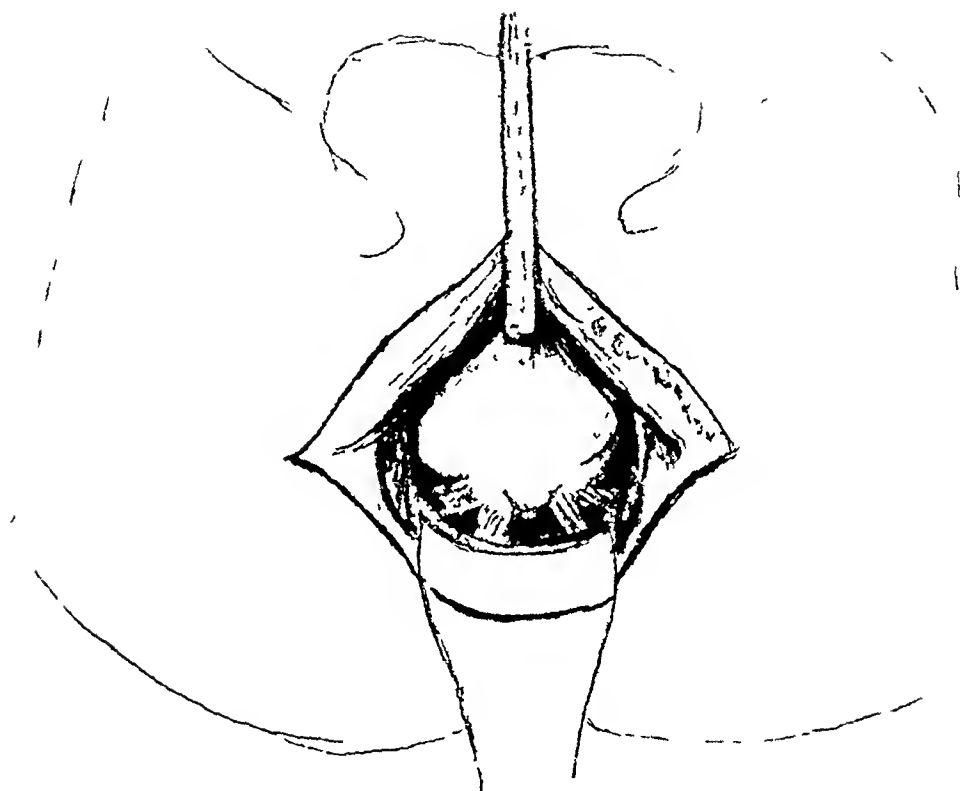


FIG 10—Showing posterior surface of prostate exposed and prostatic tractor introduced through the urethra just anterior to the apex of the prostate (Proust)

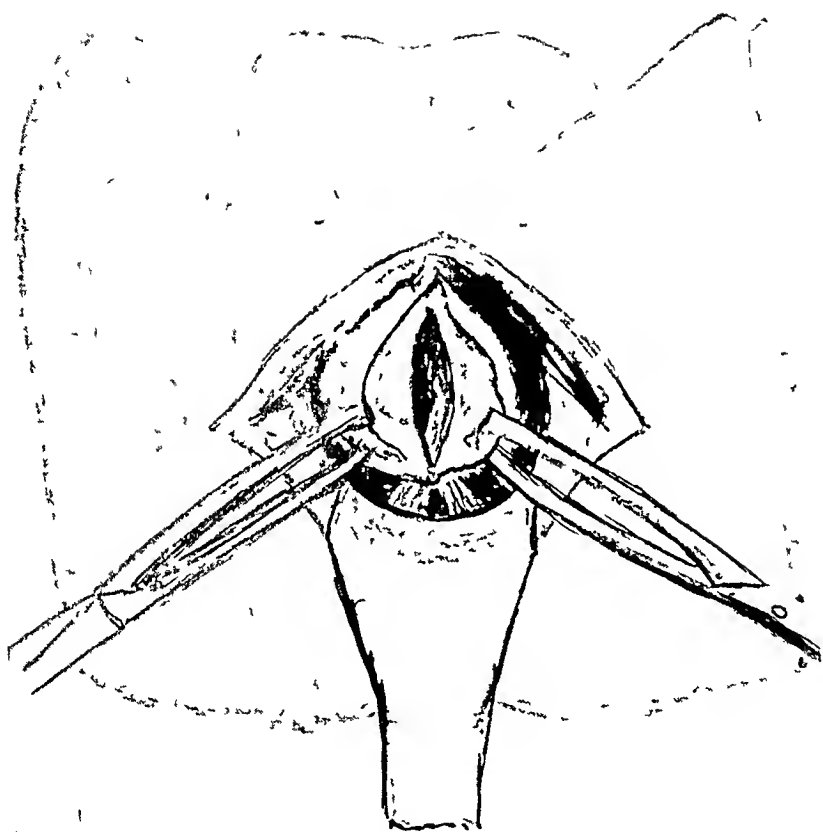


FIG 11 —Showing the laying open of the capsule and prostatic urethra (Proust)

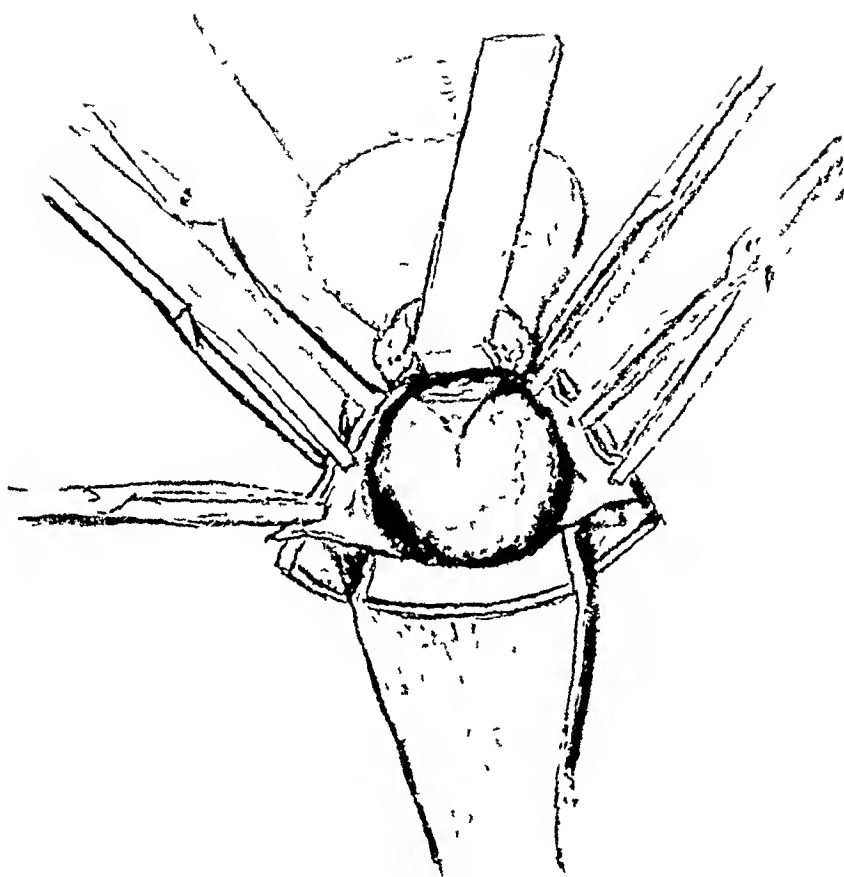


FIG. 12.—The prostatic capsule is separated and turned back from the front and the posterior aspects of the prostate, and its cut edges are held apart by retractors (Albarran).

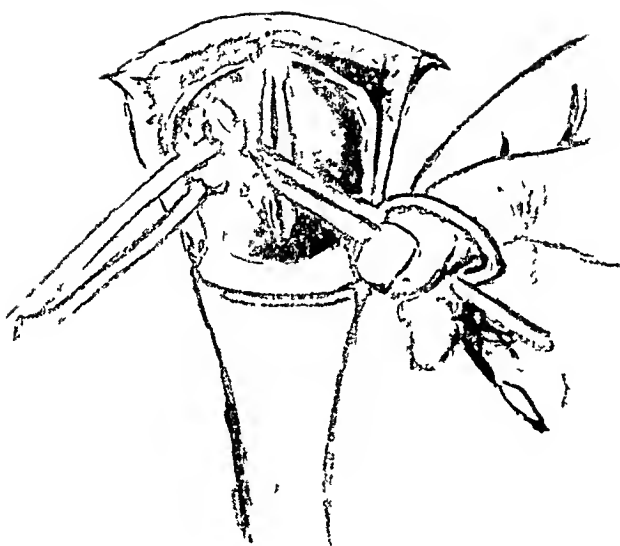


FIG 13—Exstirpation of the anterior part of the prostate begun (Albarran)

half of it. This enables him to easily reach the farthest ends of the two lobes with his finger-tip pushed on into the bladder and to draw each of the remaining parts of the gland well down into the wound by the finger-tip employed as a tractor. He then goes on to complete the freeing of the rest of the gland from the sheath, and takes what is left of it away in one, two, or more separate pieces, as it seems most convenient to do. The middle lobe is removed by splitting the floor of the prostatic urethra and enucleating the upper portion of the lobe through this opening with the finger and by dividing the lower end with scissors. When the prostatic urethra is much enlarged and baggy, he makes a longitudinal resection of it, and sutures the cut edges together afterwards.

The manner in which the capsule is turned back from the forward part of the gland and the posterior surface of the latter is exposed preparatory to enucleation by *morcellement*, as just described as the manner employed by Albarran, is shown in Fig. 12.

The manner in which the prostate and prostatic urethra are divided and in which the removal of the anterior portion of the gland is begun by Albarran is illustrated in Fig. 13.

The details of the similar operations which are practised by Haitmann, Pousson, Loumeau, Reynes, Siguita, etc., will be found handsomely illustrated and accurately described in the *Compte rendu de l'Association Française d'Urologie*, 1901 and 1902. That of Young, of Baltimore, which is similar in character, in 1903 is admirably described in the *Journal of the American Medical Association*, October 24, 1903.

The other steps that have been introduced, and by which the perineal operations were done at an earlier date than any of the above, are those of Zuckerkandl, 1889, Pyle, 1892, Nicoll, 1894, in 1895 Morris advocated the operation described by Pyle. The distinctive feature of Pyle's and Nicoll's manner of removing the gland lay in not opening the urethra at all. The enucleation in the former's way of carrying it out was to divide the capsule of the gland only in the middle line of the posterior surface of the prostate and to enucleate

each lobe in turn by the finger-tip or blunt dissector, and in endeavoring to spare the urethra while doing so. The enucleation was done within the outer sheath of the gland.

Nicoll's way was a combined operation, but the perineal part of it is the essential one, the suprapubic opening being incidental merely to the other for the purpose of depressing the gland and bringing it into the proper position for enucleation. The distinctive feature of Nicoll's operation consisted in the removal of the gland without injury to the urethra, or bladder through two lateral incisions made in the capsule near and outside of the median line. This latter feature of the technique he did not habitually employ, reserving it for cases which were unusually difficult, or in which there are very large lobes to be removed.

In the operation as done by Young, there is a definite attempt made to preserve the ejaculatory ducts. This Young says he is enabled to do. He reaches the gland through two incisions in the capsule, one on either side of the median line, somewhat similar to those employed by Nicoll, referred to above. He uses his two-bladed tractor in the same manner as that described by Pioust already referred to.

Fig 14 shows the manner in which Young employs the tractor, and also the capsular incisions on either side of the middle line. The enucleation he advises being done by a blunt dissector. Young employs another form of forceps for the purpose of aiding in bringing down the gland during the dissection and in its extraction. They are shown in Fig 15.

Still another manner of effecting the removal is that of Rydygier. Rydygier endeavors to save the prostatic urethra by means of the following manœuvre. After exposing the gland and entering through its capsule by a median incision, he frees it from the outer sheath, except upon the parts of each lobe which lie adjacent to the prostatic urethra. Having arrived at this point, he clamps the part of the gland which is still adherent along the prostatic urethra—taking first one lobe and then the other—by placing one blade of a pair of

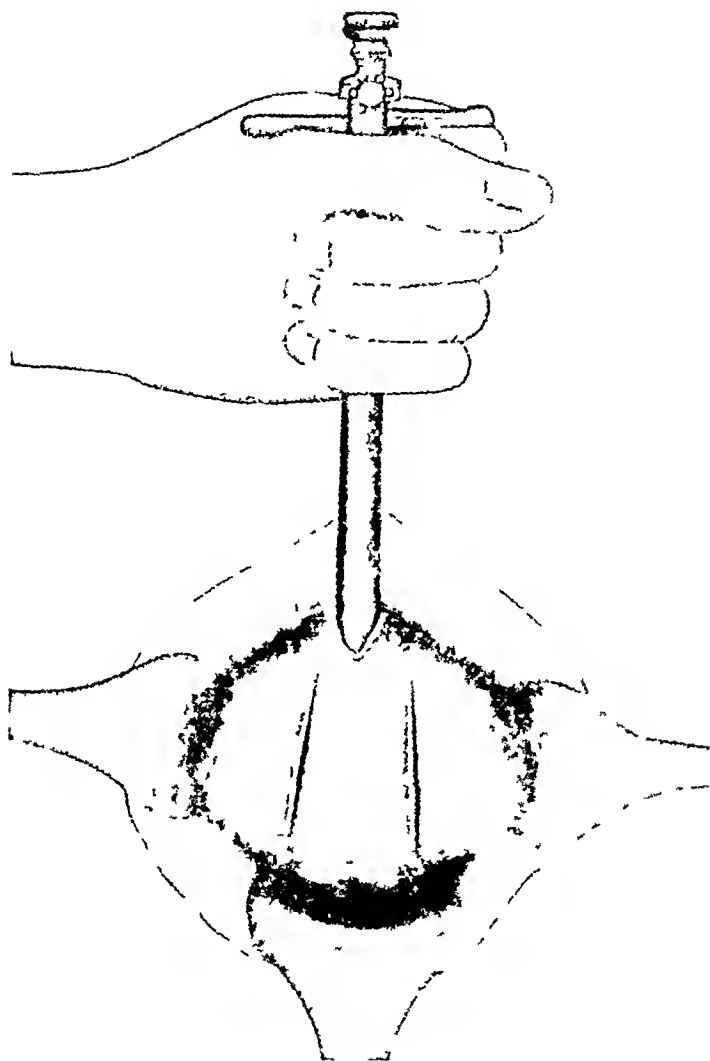


FIG. 14 — Fractor introduced, blades separated — traction made exposing posterior surface of prostate. Incisions in capsule on each side of ejaculatory ducts. (Young)

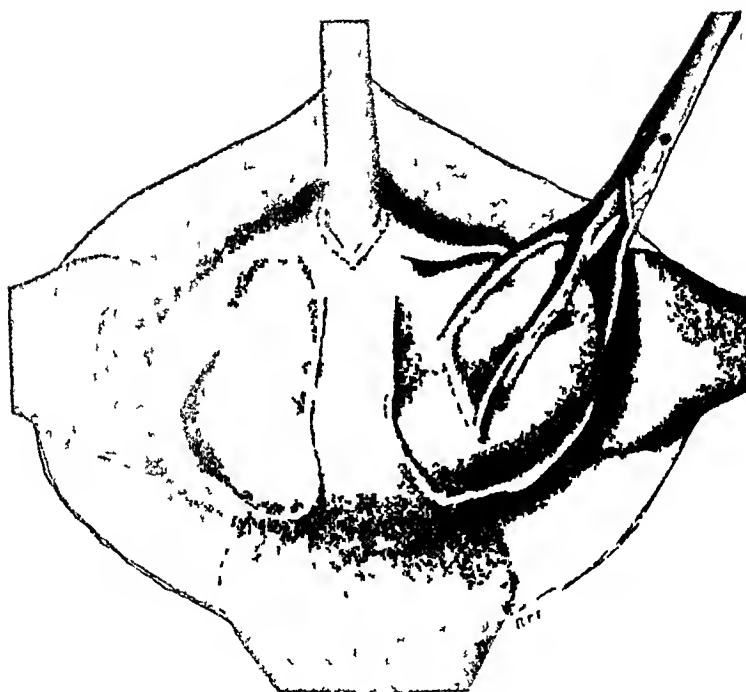


FIG 15—Enucleation of lobes Forceps in position (Young)

forceps beneath and the other above the lobe in a direction parallel with that of the urethra, then closes the blades together and cuts off the parts of the gland lying outside of them with a pair of scissors. In doing this, there is, of course, a small part of the gland which remains adherent to the outer aspect of the urethra.

Still other steps are the closure of the empty pockets in which the enucleated lobes of the gland formerly lay. Also the suture of the incised urethra. Still another feature that is strongly insisted on by Proust and by Pousson is the assistance to be gained by raising the pelvis high in the air, in a somewhat exaggerated Trendelenburg position.

The distinctive qualities which have thus far appeared with respect to the removal of the masses in connection with the different perineal operations are. The injury or absence of it to the prostatic urethra and ejaculatory ducts, the difference between the operations in which the urethra is not opened at all and those in which it is.

The other features are of minor importance, except, perhaps, the matter of the capsular incisions. The choice in this respect being between those employed by Nicoll and Young and those in the middle line which are in more general use.

There is no doubt but that, of several technical methods, all of which seek to accomplish the same result, one which attains it with the least destruction of the parts involved is to be preferred, unless there is some very good reason to the contrary.

Regarded from this point of view, the methods introduced by Pyle, Zuckerkandl, and advocated by Morris, and the recent modifications introduced by the French surgeons, are those which accomplish the removal of the hypertrophied gland with the least injury to the parts. Just how far some of these structures can remain undamaged during the manipulations demanded for the removal of the gland is more or less open to question. On the one hand, Young tells us that he is able to effect the removal without injuring either the urethra or the ejaculatory ducts. On the other Albarran and a good

many other surgeons are less confident of their ability to do so. This sort of difference of opinion is one that is frequently met with in connection with many other surgical operations.

The next question which arises is how much harm is done to the patient by injury inflicted upon the prostatic urethra or, indeed, by its entire removal along with the gland. This point will be discussed later. The same question arises with reference to the saving of the ejaculatory ducts. With regard to this there is considerable difference of opinion, a good many operators regarding it as of slight importance, others laying much stress upon their preservation in all cases in which the sexual power still exists. There is no doubt but that the preservation of the ducts is of very great moment, in certain cases in which the operation is to be done for patients who are in the fifties, whose sexual powers are still active, and with whom there is, or is likely to be, a question of marriage, and by just so much more, of course, with any patient upon whose marriage and the begetting of offspring some important matters may depend. But under any other circumstances, and where the patient is not still in the vicinity of the time of full vigor of life, the ejaculatory ducts seem, to the writer, to be of very little consequence with relation to the performance of these operations.

The only objection that can be reasonably urged against the manner of operating which involves careful dissection, is that it demands more time than is needed when doing a quick enucleation through the sides of the prostatic urethra,—that is to say, Gouley's operation, and the importance of saving time is a question that will vary according to the circumstances.

That the enucleation of the gland can be done through a median perineal and prostatic urethral incision very rapidly, and without incurring risk of injury to the urinary sphincters or the rectum, the writer knows from personal experience. It is a more rapid procedure than the others which have been sketched. That it can be done without a larger death-rate than the latter involves, is attested by the results of the series of operations done by Goodfellow, which are the best yet reported.

The bilateral capsular incisions practised by Young seem to the writer to offer an excellent road of approach through which to undertake the enucleation.

The writer is strongly of the opinion that the enucleation should always be conducted in the space between the outer sheath and the capsula vera of the gland. He cannot think that it is important to cut away the sides of the pocket formed by the sheath after the removal of the gland, and cannot see how this can very well be done without incurring the liability to hæmorrhage from the venous plexus of the prostate. He is decidedly of the opinion that it is unnecessary to suture the urethra, and does not think that the slight difference in the length of time of healing as compared to that when the wound is not sutured is enough to be of importance. The attempt to close the pockets left vacant after the removal of the lobes is, it seems to the author, a mistaken one, a complete adaptation of their inner surfaces and obliteration of the cavity is only theoretically possible, and to attempt to do it prolongs the time of the operation, and invites pocketing within the small spaces necessarily made between the sutures. There are other reasons against this manœuvre which are presumably too obvious to make it necessary to enter upon them.

SPECIAL PRECAUTIONS, ETC

Avoidance of Hæmorrhage—This is done by carrying out the enucleation with the finger, or, at any rate, by avoiding the use of a sharp instrument, and by conducting the dissection or the enucleation between the inner capsule belonging to the gland itself, and its outer sheath (in Fig. 9 the finger-tip is placed in this plane), taking care not to wound the latter, since it is within it that the venous plexus lies. This is the manner which has for many years been practised in doing enucleations and is in accordance with the anatomical teaching of Sir Henry Thompson and many anatomists which has been recently emphasized by Mr. Freyer.

In most cases in which the gland enucleates readily, there is no difficulty in entering the finger into the proper layer

wherein to carry out the separation of the gland from its sheath, but in some other cases there is difficulty in entering between the proper layers owing to the readiness with which the outer sheath splits up into a series of lamellæ. Fig 16 illustrates this condition very well. The contrary condition is well shown in Fig 17, in which specimen there is no such tendency displayed.

The varying thickness of the outer sheath in different cases, and in different parts of the same sheath, has a bearing upon the liability of the reverse of breaking through it into the prostatic urethra, either when enucleating or removing by *morsellement*. In some cases it is either absent or so thin as to afford no protection to the prostatic urethra, in which case it is impossible to avoid injury to the latter.

When the reverse is true, and there is a well-developed fibrous sheath, it is perfectly possible to avoid entering either urethra or the bladder when enucleating the lateral lobes, which are in such cases, at any rate, each enclosed within its own independent chamber, and which have no direct glandular continuity with the middle lobe when the latter is present. Enucleation without injury to the urethra is illustrated in both Fig 16 and Fig 17.

Avoidance of Injury to the Rectum and Prostatic and Membranous Urethra—Injury to the rectum is most likely to occur from using a sharp instrument without sufficient care, that is to say, without having the finger of the other hand in the rectum, or else by trying to withdraw a large mass through a small opening, or, finally, by downward pressure upon an already enucleated lobe or lobes by the finger passed above them and in attempting to draw the mass out by it. The only accident of the sort that has happened to the writer was because of neglecting to observe this precaution.

The membranous urethra is most likely to be injured through too forcible manipulation with the finger when enucleating, or by the slipping of an instrument which is being employed in the dissection, or by attempting to withdraw too large a mass through the median external perineal urethrotomy.



FIG 16—Specimen showing the manner in which the outer sheath sometimes splits up into several distinct layers. *a*, a bit of the inner capsule lifted off the surface. *b c d* represent three different layers of the outer sheath. (Author)



FIG 17—Prostate with left lobe, *a* enucleated from its chamber, *b*. The upper surface of the latter, *c*, has been turned back across the prostatic urethra, *d*, in order to display the parts, and in so doing it has necessarily been torn, but it is seen that there is no continuity between the glandular structure of the left lobe that has been removed and that of the split middle lobe *e*. It also shows that the lateral lobe may be removed in such a case without breaking into the urethra. (Author)

incision The latter is one of the reasons for not using this incision

Suprapubic Operation —With regard to the suprapubic incision, there is but one modification which the writer has found occasionally to have any advantages other than those offered by the usual cystotomy incision This consists in substituting for the median perpendicular cut a crescentic one extending through skin and subcutaneous fat, and turning up a flap from its lower margin immediately above the symphysis pubis The bladder is then reached through the usual perpendicular incision between the recti muscles

The best means for rendering the gland accessible is by lifting it upward with the fingers in the rectum and by pressure upon the perineal surface with the thumb at the same time This is the manœuvre of Pierre Franco, which he introduced in 1560 in connection with lithotomy operations

Bottini Operation —The improvements in the Bottini operation are

- 1 Not undertaking its performance unless a clear cystoscopic view has been obtained beforehand

- 2 By the better knowledge of the currents by which the blade is heated, and by securing a known degree of heat by the use of a known strength of current

- 3 By making the incisions more slowly

- 4 By adapting their length, and by placing them according to the previously determined form, etc., of the hypertrophies in individual cases, instead of using, as Bottini did until his later operations, an incision of one size for all glands, making one cut in the median line above, and one in the median line below, in all cases, irrespective of the variation presented in them, providing the instrument with several blades of different sizes, as has been done by Young, and placing the incisions appropriately, as taught by Freudenberg, have been the two most important improvements which this operation has undergone

In doing the Bottini operation the bladder should not be empty, as it is then much more exposed to the chance of

being injured by the incision Fig 18 illustrates the injury or danger to which the bladder may be rendered liable by the subsequent sloughing after an incision which implicated some of the thickness of its wall

An empty bladder also invites the accident of including in the incision the interureteral bar when the latter, as is so often the case, is enlarged and rests directly upon the upper surfaces of the hypertrophies

DISADVANTAGES, OBJECTIONS, AND ADVANTAGES

Bottom

- 1 Insufficient drainage of the bladder, and liability to retention
- 2 Secondary hæmorrhage
- 3 Liability to epididymitis and orchitis
- 4 Necessity of repeating the operation in a number of cases
- 5 Relatively small number of *cases*
- 6 The existence of the special limitations previously stated
- 7 Inability to see the steps of the operation

Perineal Operations

- 1 Greater liability to pulmonary complications and to shock
- 2 Liability to injure the rectum and the membranous urethra, and consequently to recto-urethral fistula and urinary incontinence
- 3 The limitation to its performance previously stated

Suprapubic Operation

- 1 Liability to dangers of shock and pulmonary complications

- 2 High mortality

Combined Operation

- 1 High mortality
- 2 Liability to dangers of shock and pulmonary complications
- 3 Unnecessary suprapubic opening



FIG 18 —Specimen of bladder from fatal case after the Bottini incision. Illustrates the liability to perforation of the bladder-wall by the slough of an incision made with small quantity of fluid in the bladder. *aa*, shows line of slough extending nearly through the bladder wall.

ADVANTAGES OF THE ABOVE RESPECTIVELY

Bottini

- 1 Low mortality
- 2 Minimum of danger from shock and pulmonary complications
- 3 Absence of general anæsthesia
- 4 Short period of confinement

Perineal Operations

- 1 Low mortality
- 2 Completeness of result
- 3 Open to visual dissection

Suprapubic Operation

- 1 The less liability to injure rectum and membranous urethra
- 2 Ability to remove the enucleated masses through a wider channel
- 3 Somewhat less liable to be limited in its application by anatomical conditions

Combined Operation

- 1 Greater control of the gland during steps necessary for its removal in fat subjects
- 2 Choice of removing the separated masses by upper or lower route
- 3 Freer drainage

Many of the foregoing objections should not prevail, in our judgment with regard to them, since they are not necessarily involved in their performance, but are avoidable if skill and knowledge for the purpose are possessed by the operator. Thus the objection which is frequently brought against the Bottini operation—that it is performed in the dark—is not in the writer's mind a sound one.

The same may be urged against lithotomy, or any other operation that is done without the aid of sight and of immediate contact of the finger.

Like other operations of which this is true it may properly be said that they should not be done by any one who has not special skill.

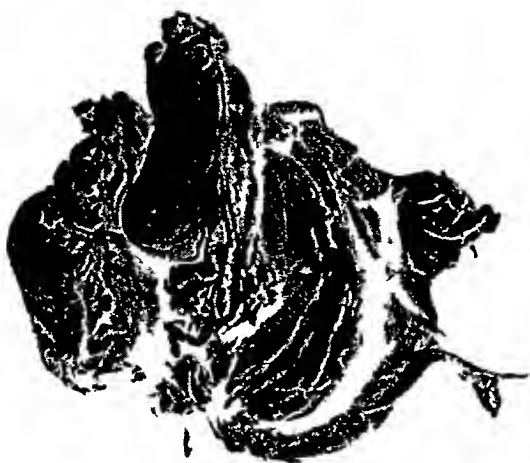


FIG 21—The three hypertrophied lobes removed together with a large part of prostatic urethra in one mass through median perineal incision. A part of the capsular propria turned back from the margin of one lobe. (Author.)



FIG 22—Total enucleation of the hypertrophied gland in three separate masses, each representing the lateral and middle lobes respectively removed by the author by perineal median urethrotomy incision, October 22, 1903. Recovery. (Author.)



FIG. 23.—The entire prostate removed in two pieces—one consisting of the two lateral and the other of the median. Removed by suprapubic prostatectomy, by enucleation with the forefinger, counterpressure from the rectum. Operation by author, August, 1894. Death from pulmonary embolism on third day. (Author.)



FIG 24 —One lateral and median lobe removed together by enucleation—a case in which it was not proper to do it. Destruction of tissue unnecessarily great, and incontinence results. Recovery. (Author.)



FIG 25 —Specimen from case of author's

acter, in which the newly formed channels remained patent and serviceable

To these the author is able to add a few other observations from his own cases of total removals of the hypertrophied gland, together with the prostatic urethra, or in connection with which the prostatic urethra was injured, as follows

1 Suprapubic extirpation in one mass together with the prostatic urethra, that is to say, after the manner of Mr Freyer's "new operation" This operation was done in December, 1897 Fig 19 is a photographic illustration of the specimen reduced in size This patient was under observation from time to time for five years, during which no harm had resulted from the removal of the prostatic urethra

2 A similar case Operation similar Performed in 1900 Under observation two years No harm resulting from removal of prostatic urethra Fig 20 is from photograph of the specimen after removal

3 Total removal in one mass with extensive injury to prostatic urethra Operation through perineal incision Under observation four years, no harm resulting from urethral injury This specimen is shown by photographic illustration, Fig 21

4 A second case, in which the mass was removed in three pieces by enucleation through an external perineal urethrotomy incision, and by exposing the gland by tearing through the sides of the prostatic urethra with the finger-tip The lobes are shown in Fig 22

5, 6, 7, 8 Four cases in which the gland was removed by the combined operation, enucleation being carried out in two through the same channel as that described in the last case, and the other two being enucleated through an opening made with the finger-nail through the intravesical coverings of the gland Three of these cases are illustrated in Figs 23, 24, and 25 The last five cases were observed during three, five, four, two, and one years respectively No harmful result from urethral injury occurred in any of them during those periods

This testimony, though small in quantity, is of positive

character and of value in view of the small number of cases in which accurate reports have been made with reference to this point

2 Can the whole gland be removed in one mass and leave the urethra behind intact?

The author has tried to do this on post-mortem specimens in a considerable number of instances, and cannot succeed even with the gland in full control on the table before him. Beyond this he will offer no opinion with regard to the matter.

With regard to the next point, however, his opinion is perfectly well defined. Assuming that Mr. Freyer's assertion with regard to leaving the urethra intact be correct, the question which naturally suggests itself is, wherein lies the particular advantage of removing the gland in one mass as compared with its total removal in two or more masses? Thus far nothing has been brought forward which furnishes a satisfactory answer to this question. It remains for him, or those who are advocating its removal in this way, to supply it.

There is one comment upon Mr. Freyer's views upon this subject which, inasmuch as we have entered upon a discussion of them, it is difficult to avoid making. It is with reference to some statements made by him at the end of a communication which appeared in the *Practitioner*, June, 1903, Vol. lxx, No. 6. Mr. Freyer says

"Under the circumstances, I submit that the results of this (his new) operation are remarkable" "I think I shall not be accused of exaggeration when I say that all previous so-called methods of radical cure for enlarged prostate are unsatisfactory" "I submit that the successful results obtained in these cases of total extirpation of the prostate encourage us in the hope that we have *at last* arrived at a rational and practical method of treatment of this painful and fatal malady"

In view of the existence of a large number of reported cases and results published in the course of the past fifteen years by some of the best known and most skilful surgeons in the world, in which the results are both with respect to

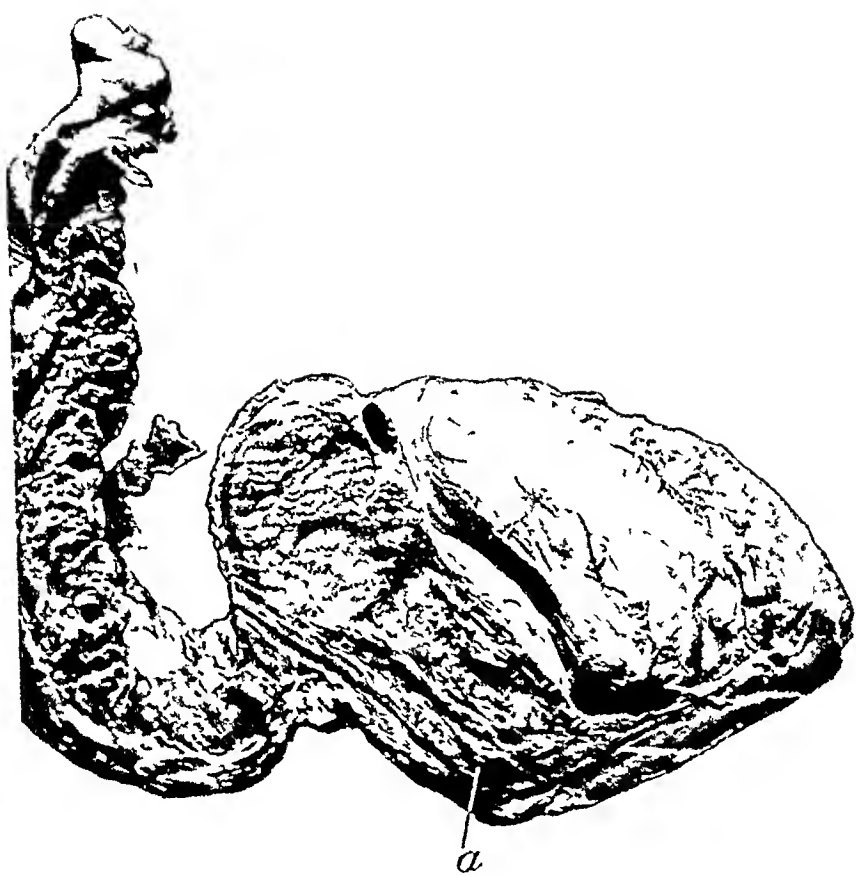


FIG. 23.—Specimen of the author's, showing the slightness of the tissue separating the under surface of the middle lobe and the retro-urethral space

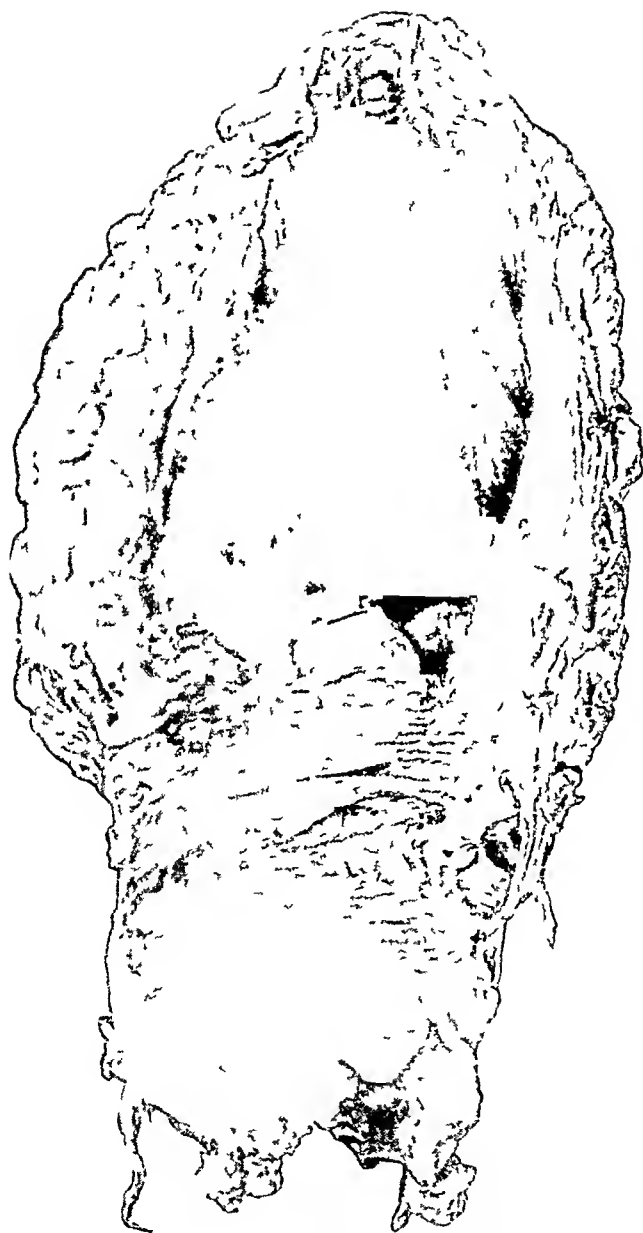


FIG. 27.—Specimen of the author's showing gland in which the attachments between the sheath and the surface of the gland are very intimate and make the case one in which it is difficult or impossible to enucleate

mortality, length of time observed, and completeness, better as well as larger in number than those presented by Mr Freyer, it is not quite apparent upon what particular features of his own series of forty-five cases with its mortality of 111 per cent, which is a little greater than that of the average of similar operations, his assertions rest

Some Points suggested to the Author in the Course of His Experience—1 Fig 26 (a) illustrates very well one point in connection with the removal of the middle lobe. It is the intimate connection, in some cases at any rate, between the posterior surface of the middle lobe's extension into the posterior urethra and the latter, also the very small amount of tissue which interposes between it and the rectovesical space outside the urethra, owing to which the latter is very liable to be torn through in the removal of the middle lobe, unless special care is taken

2 The inadvisability of persisting in the attempt to remove lobes by enucleation which are so intimately connected with their outer envelope as to be inseparable by enucleation without incurring great liability to wounding the venous plexus in the outer sheath by tearing through it while making this mistaken endeavor. Fig 27 illustrates very well a case of this kind, in which there is no clearly defined distinction between the gland's proper capsule and its outer sheath. In all cases such removal should be by *morcellement*

3 That *only* the hypertrophied part of the gland should be removed in those forms of hypertrophy which are sometimes seen, in which one or the other part of the gland is normal, while the rest is involved. In cases in which one part of the gland remains normal and the rest is hypertrophied, only the latter should be removed

Summary—1 The experience of the last fifteen years has done away with the previous opposition to the operative treatment of this malady, and has demonstrated its right to a legitimate and recognized place among surgical therapeutic measures

2 This has been due to the steady decline in the mor-

tality attending its employment and to the constantly better results obtained

3 The number of clinical data are to-day sufficient to have *per se* a definite value and authority, though not such as to allow absolute final conclusions to be drawn from them alone

4 The decline in mortality attending the operative treatment has been chiefly due to the improvements in the technique, notably in connection with the perineal radical operations, and, though in a much smaller degree, to the better selection of patients for the application of operative treatment

5 The special danger in connection with the performance of all the operations is from uræmia

6 Sepsis has played the most important part in the fatalities associated with the performance of the Bottini operation, the least in connection with that of the radical perineal and suprapubic operations

7 Postoperative pulmonary complications and shock have been minimal dangers connected with the Bottini and maximal in the other two

8 The high mortality attending the palliative drainage operations is due to the character of the cases upon which they have necessarily been performed, and not to the operations *per se*

9 In a general way it may be said that the operative mortality has fallen to at least one-half of what it was fifteen years ago

10 That the greatest gain in this respect is that shown by the perineal and suprapubic operations, the least by the Bottini

11 That the operations of total removal of the gland under improved technique are attended by a smaller mortality than are the partial removals of obstructing parts

12 That the better drainage secured by the former is one of the chief elements in determining this result

13 No one has as yet produced individual series of cases which show such favorable results with *respect to mortality* in

connection with the performance of any *other form* of operative treatment, as have Goodfellow and Albarran by the *perineal complete operations*

14 Of the distinctive methods which have been introduced into the operative field, the palliative operations for drainage,—the total removals by the perineum,—the same by the suprapubic routes, and the Bottini have survived the test of experience

15 The most important advance made with respect to the perineal and suprapubic operations has been in the recognition of the fact that the more radical procedure of total removal was not more dangerous *per se* than the partial removal of obstructing portions, and in the substitution of the more radical measures

16 The most important steps in advance with respect to the technique of the various operations have been the application of old manœuvres and the introduction of new means for making the gland more accessible, and for maintaining it in place during its removal, and the adoption and adaptation of appropriate incisions and methods of removing the hypertrophied masses, whereby this is accomplished in the most complete manner with the least injury to the structures involved in the performance of the operations

17 Owing to the greater ease thus secured in effecting the purpose, it is often possible to preserve the urethra uninjured *Often, not always, that is to say, if total removal is effected* The same is true with respect to the ejaculatory ducts

18 While injury to the prostatic urethra is not necessarily harmful, it remains to be shown what compensating advantage is secured *by any* manner of operating which involves injury to the prostatic urethra which should make us prefer to adopt it instead of an operation which seeks and offers the chance of preserving the parts with a minimum of or no injury at all

19 It is not as yet shown wherein lies the advantage of removing the whole gland, suprapubically or any other way,

in *one mass* as compared with its *total removal* in two or more masses

20 The improvements in the Bottini operation which are the most important are the adaptation of the size and location of the incision in conformity with the size and form of the hypertrophies in individual cases, and the introduction of the means by which this may be done, and the securing of more reliable heating of the blades of the instrument

21 The results with respect to cure are far better in the perineal and suprapubic operations than in the Bottini

22 There are fewer limitations associated with the performance of the suprapubic and the perineal operations than with the Bottini

CONCLUSIONS

The mistake which is such a constant factor in all affairs in which the judgment is involved, namely, that of excessive partisan advocacy of one or another manner of accomplishing a certain thing to the exclusion of other ways, has been unusually conspicuous in connection with the history of the development of the operative treatment of this malady. It is aptly owing in part to the fact that it is a problem which necessarily acquires a painfully personal significance to a portion of those who are engaged in the attempt to solve it in the best way, and partly because surgeons, to whom it is a new subject, are at intervals entering the field and undertaking these operations, and having but little time to read or learn what has gone before become absorbed by their interest in one manner of operation, and do not obtain a proper perspective of the subject. It has been very interesting to those who have, so to speak, grown up with the operative treatment, to see how often, within a very short cycle, the same ideas have occurred to different men, and been introduced as new methods, unconscious of their having been in use before, and of having been, in most instances, discarded because not good, or having been superseded by something better. The fact that should be first of all kept clearly before the mind is this, which I will state, as I stated it sixteen years ago, for it is as apt now as it was

then, "that, contrary to what would be inferred from the writings of various authors, we do not *in all cases* have a free choice of a number of operations, but are more or less compelled to the selection of one or another of them according to the conditions presented in individual cases" (Watson on the "Operative Treatment of the Hypertrophied Prostate," 1888) What those conditions are has been shown in the course of the communication

1. The most important single factor in determining whether or not radical operative treatment should or should not be applied is the capability or the reverse of the renal function Other than this are the general strength or feebleness of the patient, his comfort or suffering, and the probability of the continuance of the one or the occurrence of the other if operative treatment is *not* applied

2 Radical operative treatment has not as yet reached the status at which we are justified in saying that all cases of prostatic hypertrophy should be submitted to it as soon as the condition is clearly made out, and has begun to give rise to slight symptoms But we are justified in saying that patients should be given the benefit of it at a much earlier stage of the malady than it has been customary to apply it, and that where it is applied by those skilled in its performance, as soon as the hypertrophy can be clearly detected by examination, and if at the same time it is already giving rise to well-marked symptoms, and the patient's condition is not unfavorable to the performance of an operation of this magnitude, the mortality of the operations, *were they applied at that time, will be a trifling one, and their risks not nearly so great as those entailed by the use of the catheter, assuming the latter to have been employed instead and under the same conditions*

3 The operations should be undertaken under favorable circumstances as soon as the above conditions occur

4 With regard to choice of operation, the following are the writer's conclusions

Under conditions in which there is nothing to prevent a free choice of method,—

1 The total removal of the gland by the best of the perineal technique is that of choice

2 When any condition is present which makes the perineal operation too difficult of performance, or is a contra-indication of any sort to its application, the suprapubic operation is the operation of choice, and when contraindications are present which make this operation undesirable, the Bottini becomes the operation of choice, and when the patient's condition is such as to make any of the above three methods inappropriate, and we are obliged to do something, we will do a palliative operation for drainage

Cystoscopic examination should, when it can be readily done, precede operations of all sorts in which there is any doubt as to the exact nature of the hypertrophies, and is essential to the proper performance of the Bottini. Its utility with regard to the other operations is that of learning whether or not there is present a middle lobe of such size and position as to make the perineal operation especially difficult of performance

BIBLIOGRAPHY

- Adenot *Ann des Mal des Org Gen-Urin*, September, 1902
 Albarran and Halle *Ann des Mal des Org Gen-Urin*, February, 1900,
Bull de la Soc de Chir, Paris, November 5, 1901, *Ann de Ma*,
 Tome xxi, p 1672 *Compte rendu de l'Assoc Française d'Urologie*,
 1901
 * Alexander, Samuel 1895, *New York Medical Record*
 Andrews, E W *Journal of the American Medical Association*, October
 18, 1902
 Atkinson Quoted by Moullin
 Bangs, L Bolton *New York Medical Record*, March 9, 1901
 Belfield *Medical Record*, March 10, 1888, *American Journal of the Medi-*
cal Sciences, November, 1890, *Journal of the American Medical Asso-*
ciation, September, 1886, and March, 1887
 Bierhoff, F *Journal of Cutaneous and Genito-Urinary Diseases*, New
 York, 1900, LVIII, p 485
 Billroth 1867
 Bottini *Arch f klin Chir*, xxi, p 1, 1877, *Berlin klin Woch*, Novem-
 ber, 1890, *London Lancet*, 1885, 1, p 582
 Bouffier *ANNALS OF SURGERY*, 1902, p 838
 Brown, Buckston *Lancet*, November 23, 1901
 Bryson *St Louis Medical Record*, February 22, 1902, *ANNALS OF SUR-*
GERY, November, 1902

OPERATIONS FOR PROSTATIC HYPERTROPHY 889

- Cabot, A T 1893, David Clapp & Son, Boston, ANNALS OF SURGERY, September, 1896
- Casper Berl klin Woch, 1888, p 461, Centr fur Chir, No 31, 1903, p 850
- Cautermann Société Belge d Urologie, Séance de February 1, 1903
- Chetwood New York Medical Journal, May 31, 1902
- Clarke, Bruce British Medical Journal, October, 1889
- Collins, Sir W J
- Crandon ANNALS OF SURGERY, December, 1902
- Czerny Centr fur Chir, June 13, 1903
- Deaver Philadelphia Medical Journal, April 19, 1902
- Delageniere, H Arch Provinc de Chir, June, 1902
- Delbet Société Anat, July, 1902
- Desnos Ann des Mal des Org Gen-Urin, December, 1895
- Dittel Wiener klin Woch, 1890, No 18, Intern klin Rundts, Wien, June 18, 1893
- Dorst Ann des Mal des Org Gen-Urin, Tome XXI, 1903, p 1666
- Durand Ibid, 1903, p 1801
- Ferguson A Paper at Western Surgical and Gynæcological Association, December, 1901
- Fergusson, Sir Wm London Lancet, January 1, 1870
- Freudenberg, A Verhand d Deutsch Gesell f Chir, 1897, Centr f Chir, 1897, No 29, New York Medical Record, July, 1898, Berlin klin Woch, 1899, No 23, Deutsche med Zeit, 1900, Nos 1-6, New York Medical Journal, February 12, 1898
- Freyer Practitioner, June, 1903, British Medical Journal, February 1, 1902, Lancet, January 19, 1901
- Frisch, A O von Die Krank der Prost, Wien, 1899, Alfred Holder
- Fuller, Eugene Diseases of the Genito-Urinary System, Macmillan Co, New York, 1900
- Gerster, Arpad Mount Sinai Hospital Reports, Vol III, 1903, New York
- Goldman Beitr z klin Chir, Band XXXI, Heft 1
- Goodfellow Personal communication, Paper before California Academy of Medicine, April 29, 1902
- Gouley, J W S Diseases of the Urinary Organs, New York, 1873 and 1879
- Guteras, Ramon Journal of the American Medical Association, November 2, 1901
- Guthrie Anatomy and Diseases of the Urinary and Sexual Organs, London, 1836
- Harrison Surgical Disorders of the Urinary Organs, third edition, 1887, London, Stone, Prostate, etc, 1899, also Lancet, 1886, also Lancet, May 5, 1900, British Medical Journal, July 4, 1903
- de la Harpe Centralb fur die Krankh der Harn und Sexual Organs, Vol XII, p 17, 1901
- Hawley, G W ANNALS OF SURGERY, Vol XXXVIII, November, 1903, p 609
- Heresco Ann des Mal des Org Gen-Urin, Tome XXI, 1903, p 1666
- Horwitz Philadelphia Medical Journal, June, 1901

- Jaboulay Societe Chir de Lyon, March and April, 1902
- Jessop In McGill's article, Treatment of Retention of Urine from Prostatic Enlargement, Leeds, 1889
- Keyes Journal of Cutaneous Genito-Urinary Diseases, 1892
- Kuster Munch med Woch, April 14, 1891
- Kutner Centr fur Chir, 1903, No 36
- Landerer Deutsch Zeits fur Chir, xlv, 5, 1886-7
- Legueu Ann des Mal des Org Gen-Urin, Tome xxi, 1903, p 1666, Sem Med, No 52, 1895
- Leisrunk Arch fur klin Chir, xlviii, p 578, Berlin, 1882
- Leroy d'Etiolles Compt Rendus des Sciences, Vol iv, p 551
- Lewis, Bransford International Journal of Surgery, October, 1889, Journal of Cutaneous and Genito-Urinary Diseases, July, 1902, Medical Review, St Louis, February 11, 1899
- Lilienthal Mount Sinai Hospital Reports, Vol iii, 1903, New York
- Loumeau Ann des Mal des Org Gen-Urin, Tome xlx, 1903
- Lydston ANNALS OF SURGERY, September, 1903
- MacGowan, Granville New York Medical Record, May 3, 1902
- McGill Treatment of Retention of Urine from Prostate Enlargement, Leeds, 1889
- Mayo, Wm St Mary's Hospital Reports, Rochester, Minn, 1904
- Meyer, Willy New York Medical Record, March 5, 1898, Ibid, January 14, 1899, Ibid, April 28, 1900, ANNALS OF SURGERY, July, 1902
- Moore, James E Transactions of the American Surgical Association, Vol x, p 59, 1902, ANNALS OF SURGERY, March, 1904
- Morris Injuries and Diseases of the Genital and Urinary Organs, 1895
- Morton, H H New York Medical Record, September 17, 1898
- Moullin, Mansell The Operative Treatment of Enlargement of the Prostate, Lectures before the Royal College of Surgery, 1892, Enlargement of the Prostate, Philadelphia, P Blakiston Son & Co, 1894, London Lancet, December 5, 1903
- Moynihan ANNALS OF SURGERY January, 1894
- Murphy Journal of the American Medical Association, March 19, 1902, Ibid, March 22, 1901
- Nicoll London Lancet, April 14, 1894
- Norton Medical Press and Circular, January, 1892
- Pauchet Ann des Mal des Org Gen-Urin, Tome, 1666, 1903
- Proust Monograph, Paris, 1903, published by C Naud, Centrblt f Chir, June 27, 1903, also Compte rendu de l'Assoc Française d'Urologie, 1901
- Pyle Medical Record, New York, 1892, Vol xlii
- Rafin Ibid
- Ramm, Fredrik 1893
- Reynes Ibid, Tome xxi, 1903, p 1666
- Riedel Ann des Mal des Org Gen-Urin, Tome xxi, 1903, Deutsch med Woch, No 44
- Robson, Mayo Quoted from Moullin, British Medical Journal, 1889
- Rochet Ann des Mal des Org Gen-Urin, Tome xxi, 1903, p 851

Rovsing Arch fur klin Chir, 1902, p 934.

Ruggi Ibid

Rydygier Zentr f Chir, January 9, 1904

Schmidt, Meinhard Deutsch Zeits f Chir, Band xxviii

Socin Billioth and Pitha, Band iii, Heft 8

Syms, Parker ANNALS OF SURGERY, April, 1902

Thompson, Sir Henry Diseases of the Prostate, Their Treatment and Pathology edition of 1886, Philadelphia, P Blakiston & Co, 249 pages, 8vo Enormous Prostate, etc, Permanent Drainage over the Symphysis Pubis, British Medical Journal, 1887, ii, 1, 1103 Some Important Points connected with the Surgery of the Urinary Organs, Lectures, 1884

Thorndike, P Boston Medical and Surgical Journal, August 13, 1903

Trendelenburg British Medical Journal, November, 1889

Verhoogen Ann Soc Belge de Chir, November, 1901

Vignard, Edmond De la Prostatotomie, etc, Paris, G Steinheil, 1890
Compte rendu de l'Association Française d'Urologie, 1902

Villard Ann des Mal des Org Gen-Urin, p 1801

Voelcker Arch fur klin Chir, Berlin, 1903, Band lxxi, Heft 4

Wainwright ANNALS OF SURGERY, May, 1903

Watson, F S Operative Treatment of the Hypertrophied Prostate, Boston, 1888, Operative Treatment of the Hypertrophied Prostate, Boston Medical and Surgical Journal, August 15, 1895, Report of Cases of Castration, Ibid, April 18, 1895, Case of Suprapubic Prostatectomy, Ibid, March 7, 1889, Lecture International Clinics, Vol iii, second series, p 260, also Vol iv, Ibid, Discussion, Transactions of the American Surgical Association, 1902, p 72

White, J W ANNALS OF SURGERY, August, 1893, Ibid, July, 1895

Wishard, W N New York Medical Journal, August 17, 1901, Journal of Cutaneous and Genito-Urinary Diseases, March, 1892

Woolsey Journal of Cutaneous and Genito-Urinary Diseases, August, 1895, p 314, ANNALS OF SURGERY, 1902, p 409

Wossidlo, H Centr b fur d Krankh d Harn u Sex Org, 1900, xi, p 113

Young Journal of the American Medical Association, January 11, 1902, Ibid, October 24, 1903

Zuckerkindl Wiener klin Woch, No 44, Wiener med Press, 1889, p 857

PRIMARY CARCINOMA OF THE PROSTATE

BY GEORGE W HAWLEY, M D,
OF SEATTLE, WASHINGTON

No one can scan the literature and fail of the opinion that the popular beliefs in regard to cancer of the prostate are vague and incomprehensive, often misleading, for the most part in error, and in need of elucidation and revision. To quote Eduard Kaufmann,¹⁹ by whom this subject has received exhaustive and careful study "Die Lehr-und Handbueher bringen uber dieses Thema nur wenig, zum Theil auch Falsches." Moreover, it is impossible after a search of the writings to overlook the fact that this disease has enlisted but casual interest and investigation in this country, that during the past decade the work of a few European observers has enriched our knowledge of the pathology necessitating reconstruction of our conception of prostatic cancer.

In few conditions has surgical science been more backward, and few malignant involvements illustrate so beautifully the peculiar features of development—favorite modes of local growth and sites for metastatic deposit—which malignant disease so frequently exhibits in different organs and which require careful notation and consideration if we would hope to recognize prostatic cancer, and apply measures of relief, with intelligence.

It is therefore not unbecoming, especially in view of the evidence that carcinoma of the prostate is more common than formerly believed, and radical cure possible in early cases, to entertain a closer scrutiny and obtain a more comprehensive and definite picture of this oft overlooked disorder.

OCCURRENCE

In General—Prostatic cancer has long been catalogued among the rare malignant affections, the basis for such classifi-

cation resting not alone on clinical facts, but in the mass of post-mortem records. Despite such proof, the opinion has been for some time current that this disease is less infrequent than statistics indicate, that it often passes unrecognized in vivo and at necropsy. This view has received confirmation in the broadening of our knowledge concerning the morbid anatomy of prostatic cancer. It has been demonstrated that carcinoma of the prostate is often extremely difficult of post-mortem diagnosis without the aid of the microscope. The futility, then, of obtaining an accurate estimate of the frequency of prostatic cancer is apparent, inasmuch as no long series of autopsies is to be found which includes a systematic and careful examination of the prostate. Present post-mortem records are palpably inadequate, for not only do prostates which are macroscopically altered sometimes escape observation, but of those which have received gross examination few have obtained histological diagnosis. Illustrative of the inaccuracy of post-obit records are the results of Albarran and Hallé's¹ investigation—the finding of several cancerous prostates among those labelled hypertrophy in the Musée Guyon.

While it is quite probably true that the statistics which have been put forward represent but an unknown fragmentary estimate, and it is necessary to bear this in mind, they are worthy of perusal. It is significant that more recent and accurate figures give an increased percentage for prostatic cancer, not that it is believed to be of more frequent occurrence, but that it has less often escaped detection.

Ratio of Prostatic Cancer to Pan-cancer—The statistics popularly quoted are those of Tanchou published more than half a century ago. In 1844, he collected from the Paris death-register 8289 cases of cancer, finding only five in which the disease was located in the prostate among the 1904 male subjects,—a ratio of 2.6 per 1000. Von Winiwarter, in a *résumé* of the cancer cases occurring in Billroth's clinic during 1868–1875, cites one prostatic in a total of 548 cases of carcinoma (290 men),—a ratio of 3.4 per mille. Heilmann, in 20,544 cancer cases recorded in Germany during the two years

1895-96, reports thirty-four as occurring in the prostate (8127 male),—a ratio of 4.18 per mille. The increase shown in the latter figures is pertinent, and gives weight to the declarations of a few investigators who maintain that careful observations will prove many cases diagnosed prostatic hypertrophy to be in reality carcinoma, and cancer a disease of unexpected frequency.

Prostatic Cancer in Urogeutal Clinics—In addition to the above, clinical records have an interesting bearing on the frequency of prostatic cancer. Engelbach¹⁰ in 1898 found, during nine months, four cases of carcinoma of the prostate out of 700 patients in Necker Hospital. Burckhardt⁶ (1902) similarly found fifteen out of 1673 genito-urinary cases during several years. Of this number 386 were prostatic disorders, including inflammations, hypertrophy, etc. Oraison²⁵ (1903) reports twenty-eight of cancer among 306 "prostatics" at Necker Hospital during the last three years, and at Saint André sixteen out of 170 cases in twelve years. These figures again lend evidence of the relative frequency of prostatic cancer, and with post-mortem statistics go far to corroborate the utterances of those who have given this matter thought as expressed by Labadie,²³ who says, "La cancer de la prostate est une affection relativement fréquente," and Harrison¹⁷ who remarks, "My belief is that carcinoma of the prostate is far more common than we have been led to think."

Sarcoma¹ and Carcinoma—Formerly very little, if any, distinction was made between sarcoma and carcinoma. Belfield² states that seven-eighths of prostatic tumors are found to be carcinoma, the remainder sarcoma. Von Frisch¹² gives 85-90 per cent. as the frequency of cancer in malignant disease of the prostate. Unanimous are all writers that carcinoma is much the commoner.

* Consideration of sarcoma is purposely omitted in this paper because confusion is to be avoided, and—more important—because sarcoma, unlike carcinoma, does not offer the same difficulties of diagnosis, rarely simulating or occurring at the same age as hypertrophy. Sarcoma is prone to more extensive and diffuse growth. As a rule, it occurs before thirty, often in childhood, very occasionally after fifty.

Primary and Secondary Involvement —As a rule, malignant disease of the prostate is primary. Secondary involvements, as Kaufmann has pointedly declared, are rare, and then usually due to direct extension from neighboring organs. Of sixty-two cases of malignant disease of the prostate, Engelbach found only eleven (17 per cent) to be of secondary origin. To these Burckhardt added two more and sought the primary focus. Seven of the thirteen proved to be the result of direct local extension from the rectum, bladder, and penis. The remainder represented metastatic deposit from remote organs, such as the stomach, lungs, dura mater, etc.

Cancer in the Hypertrophied Prostate —While this condition has been questioned, doubt no longer can exist that cancer does develop in so-called senile enlargement, and it is presumable that these cases of *hypertrophy-cancer* are not infrequent. Cases of this kind were reported by the older writers, notably, Sir Henry Thompson,²⁹ Klebs, and Socin. Richard Wolff³¹ mentions nine such cases, and Burckhardt relates a case of carcinoma which unquestionably developed in an hypertrophied prostate. Greene and Brooks¹⁴ record three cancerous out of fifty-eight hypertrophied organs examined. Albanian and Hallé, who have given particular study to this question, found evidences of cancer in fourteen out of 100 enlarged prostates, and Belfield,³ in his remarks upon their work, opines "That their contention is amply supported by general clinical experience." Greene,¹⁵ in a paper presented at the last meeting of the American Association of Genito-urinary Surgeons, places the frequency of these hypertrophy-cancer cases at from 5-10 per cent, a conservative estimate as judged from the above figures.

Carcinoma in the Atrophic Prostate —The similarity in the nature of the two processes—hypertrophy and atrophy of the prostate—has been emphasized by Ciechanowski⁷ and Crandon,⁹ and von Recklinghausen²⁶ has called attention to cancer in the atrophic as well as in the hypertrophied gland. In one of his cases the prostate was atrophied measuring only thirty-five by twenty millimetres. Additional cases have been

observed by von Frisch, Julien,¹⁸ and others. While atrophy itself is uncommon and *atrophy-cancer* must be still rarer, it is a point of clinical moment to know that this dual condition may exist.

ETIOLOGY

The pathogenesis of carcinoma of the prostate is a subject at once a part of that branch of pathology which concerns malignant disease in general and beyond the compass of this article. Suffice it to say that of the various hypotheses which have been advanced,—bacterial, parasitic, cell-reversion, etc,—the so-called chemical theory claims particular attention in prostatic disease. A thesis ascribing carcinoma, and likewise hypertrophy, to chemical or physical action of pathologic substances derived from the prostatic secretion is a plausible one. In few glands are the conditions more favorable for the development of morbid bodies or of normal ones in pathologic quantity. The prostatic secretion is not only of a highly complex nature, but subject, normally, to extraordinary variations. It is quite rational to suppose that very little would be required to produce such pathologic substances, that diminished nutrition and non-activity as seen in the old may be sufficient factors, as well as chronic inflammation following gonorrhœa. In evidence of formation of morbid chemical bodies in the prostatic secretion may be mentioned the corpora amylacea.

While it is not to be supposed that hypertrophy or cancer results from every heteroplasmic substance developed in a perverted prostatic secretion, it is reasonable to believe that there may be formed certain bodies which have such action. At any rate the chemical thesis—in the case of the prostate—appears endowed with as much logic as any now in favor, and subserves the tenet, projected by Ciechanowski, that a chronic inflammatory process in the prostate is indispensable to senile changes.

It is interesting to note that von Hoffmann, who has chemically examined the hypertrophied prostate, observed the presence of certain substances not found in the normal gland. Similar investigations as to the character of the prostatic secretion in cancer and in hypertrophy may throw some light on this subject.

Predisposing Causes—The gonococcus infection of the urethral tract has been extensively argued as an etiological factor both in hypertrophy and in cancer. Its relation to these two morbid changes has not been definitely made out. The probabilities are that gonorrhœal infections of the intrapelvic urethra and prostate are factors in the production of prostatic hyperplasia and cancer. On the other hand, these diseases unquestionably develop independently of, and years after, a gonorrhœa. And of all the "gonorrhœics" but a moderate proportion become afflicted with these senile sequelæ. The evidence compels the placing of urethritis among the predisposing causes, as Ciechanowski has done, when in discussing the etiology of hypertrophy and emphasizing chronic inflammation as an essential forerunner, he conservatively adds that the inflammatory process may be due to, although it does occur without, a gonorrhœa.

Julien sought the frequency of urethritis in forty-seven cases of prostatic carcinoma, finding it positive in twenty-one, negative in nine, and questionable in seventeen. Burckhardt, in ten personal cases, reports only one in which there had been a previous urethritis.

Age is a notable feature. Cancer of the prostate has rarely been met with before fifty. In this respect it resembles hypertrophy and contrasts with sarcoma. Of 100 cases collected by Kaufmann all were over forty, only eight under fifty, and 68 per cent between fifty and seventy. A few cases have been observed under forty. Wolff found six cases in the literature, the youngest being twenty-nine. Heredity, climatic, racial, and other conditions, as predisposing causes, are unimportant, and bear the same relations to prostatic as to cancer of other organs.

PATHOLOGICAL ANATOMY

It is only within the last decade or so that the morbid anatomy of prostatic cancer has received anything approaching satisfactory investigation. Previous to this the knowledge of the pathology was crude and restricted. Sarcoma and carcinoma were confused, so much so that from the older records

it has been impossible to separate the one from the other, although it is known now that cancer never occurs in infancy notwithstanding a few cases so diagnosed formerly. For many years only one form of carcinoma was recognized, namely, the massive, rapid growth later aptly called by Felix Guyon "carcinose prostatopelvienne diffuse." Occasionally other forms were described to which the terms "fungoid," "encephaloid," and "scurrhous" were attached. Thompson was probably the first to call attention to the small, hard, scirrhus cancer. Later, Fenwick¹¹ announced his belief in the predominance of this form, which he likened to mammary scirrhus. This it closely resembles but von Firsch has pointed out that the term is, histologically speaking, incorrect. Concerning extension and metastases nothing definite was known.

Upon such meagre knowledge of the pathology, the descriptions of prostatic carcinoma have been necessarily vague and often contradictory. This largely holds true to-day. By many we are told that this disease is characterized by extensive growth, by others that in the majority of cases it is of the small scirrhus type. Of metastases, we read that glandular involvement is quite invariable, with little but brief reference to invasion of the bones.

With the splendid work of von Recklinghausen (contributed to the *Festschrift* in honor of Rudolph Virchow in 1891), who first brought out the richness and frequency of skeletal metastases, together with the more recent extensive investigations of Kaufmann, who has not only studied critically his own many cases, but all authentic records in literature, has the pathological anatomy been placed on a broad and comprehensive basis. The result of their work has been to show that, grossly, several forms of prostatic cancer are to be recognized, that the so-called common massive type is in reality rare, that histologically several distinct and mixed varieties are found which develop in the hypertrophied, normal, and atrophic gland, that carcinoma tends not to regional extension nor to ulceration, that metastasis to the lymph-glands is not as common as in carcinoma elsewhere, but, on the other hand, is

exceedingly frequent to the bones and quite general throughout the skeleton. These two investigators have also emphasized the difficulty of post-mortem diagnosis by naked-eye appearance alone. Even the sight of the skilled pathologist often fails to detect carcinoma in the prostate. To distinguish between hypertrophy and hypertrophy-cancer is particularly difficult. Microscopical diagnosis is essential in the majority of cases, as Kaufmann²⁰ has forcibly declared. Interesting in this regard is the case of Sasse,²⁸ in which diagnosis failed during life. Autopsy revealed an enlarged prostate and rich carcinomatous metastasis in the bones. On careful gross examination it could not be said whether the prostate was cancerous or not. The microscope disclosed cancer.

GROSS ANATOMY

Size and Form — Four forms of prostatic cancer have been distinguished. (1) The *very small*, which includes only those cases of atrophy-cancer with limited growth. (2) The *small*, in which the prostate is of about normal size. (3) The *large*, in which the prostate is enlarged by reason of carcinomatous growth or from the condition of hypertrophy-cancer. (4) The *very large* or the enormous pelvic form. All are found at autopsy, which fact confirms the belief that the primary growth may be very small, even in the late stages. The first three forms collectively, in comparison to the massive type, occur in the proportion of about seven to one.

Thus, Kaufmann out of 100 cases found only fourteen of Guyon's carcinose diffuse. These findings are consonant with Harrison's statement that "carcinoma of the prostate, in by far the larger proportion of cases, is small and of slow-growing nature."

Location and Local Growth — With few exceptions the disease process is situated in the recto-urethral prostate, in one or both of the lateral lobes, or more rarely in the middle lobe. Only very infrequently has the pre-urethral portion of the prostate been found invaded. Carcinoma begins usually as one or several small nodules, which may remain quite stationary

it has been impossible to separate the one from the other, although it is known now that cancer never occurs in infancy, notwithstanding a few cases so diagnosed formerly. For many years only one form of carcinoma was recognized, namely, the massive, rapid growth later aptly called by Felix Guyon "*carcinose prostatopelvienne diffuse*." Occasionally other forms were described to which the terms "*fungoid*," "*encephaloid*," and "*scirrhus*" were attached. Thompson was probably the first to call attention to the small, hard, scirrhus cancer. Later, Fenwick¹¹ announced his belief in the predominance of this form, which he likened to mammary scirrhus. Thus it closely resembles but von Fusch has pointed out that the term is, histologically speaking, incorrect. Concerning extension and metastases nothing definite was known.

Upon such meagre knowledge of the pathology, the descriptions of prostatic carcinoma have been necessarily vague and often contradictory. This largely holds true to-day. By many we are told that this disease is characterized by extensive growth, by others that in the majority of cases it is of the small scirrhus type. Of metastases, we read that glandular involvement is quite invariable, with rare but brief reference to invasion of the bones.

With the splendid work of von Recklinghausen (contributed to the *Festschrift* in honor of Rudolph Virchow in 1891), who first brought out the richness and frequency of skeletal metastases, together with the more recent extensive investigations of Kaufmann, who has not only studied critically his own many cases, but all authentic records in literature, has the pathological anatomy been placed on a broad and comprehensive basis. The result of their work has been to show that, grossly, several forms of prostatic cancer are to be recognized, that the so-called common massive type is in reality rare, that histologically several distinct and mixed varieties are found which develop in the hypertrophied, normal, and atrophic gland, that carcinoma tends not to regional extension nor to ulceration, that metastasis to the lymph-glands is not as common as in carcinoma elsewhere, but, on the other hand, is

exceedingly frequent to the bones and quite general throughout the skeleton. These two investigators have also emphasized the difficulty of post-mortem diagnosis by naked-eye appearance alone. Even the sight of the skilled pathologist often fails to detect carcinoma in the prostate. To distinguish between hypertrophy and hypertrophy-cancer is particularly difficult. Microscopical diagnosis is essential in the majority of cases, as Kaufmann²⁰ has forcibly declared. Interesting in this regard is the case of Sasse,²⁸ in which diagnosis failed during life. Autopsy revealed an enlarged prostate and rich carcinomatous metastasis in the bones. On careful gross examination it could not be said whether the prostate was cancerous or not. The microscope disclosed cancer.

GROSS ANATOMY

Size and Form — Four forms of prostatic cancer have been distinguished. (1) The *very small*, which includes only those cases of atrophy-cancer with limited growth. (2) The *small*, in which the prostate is of about normal size. (3) The *large*, in which the prostate is enlarged by reason of carcinomatous growth or from the condition of hypertrophy-cancer. (4) The *very large* or the enormous pelvic form. All are found at autopsy, which fact confirms the belief that the primary growth may be very small, even in the late stages. The first three forms collectively, in comparison to the massive type, occur in the proportion of about seven to one.

Thus, Kaufmann out of 100 cases found only fourteen of Guyon's carcinose diffuse. These findings are consonant with Harrison's statement that "carcinoma of the prostate, in by far the larger proportion of cases, is small and of slow-growing nature."

Location and Local Growth — With few exceptions the disease process is situated in the recto-urethral prostate, in one or both of the lateral lobes, or more rarely in the middle lobe. Only very infrequently has the pre-urethral portion of the prostate been found invaded. Carcinoma begins usually as one or several small nodules, which may remain quite stationary

throughout the course of the disease, yet giving rise to extensive and virulent metastases. The process may involve only a portion of the whole of one or both lateral lobes, more rarely the whole gland. Emil Burckhardt recounts an unusual case in which the disease was limited to the middle lobe, causing an elevation of the bladder floor.

Surface changes are usually noticed. An irregular, nodose appearance of the external surfaces and borders of the portion of the gland involved is the rule. Mechanical displacement of adjacent structure due to expansion of the prostate is not great except in hypertrophy-cancer, largely owing, perhaps, to the fact that the middle lobe is rarely involved.

Consistency—Cancer of the prostate is characterized by distinct hardness, often spoken of as a "stony-hardness." It is this feature which gave rise to the term *scirrhus*. So prominent is this phenomenon that Guépin¹⁶ looks upon it as a clinical sign of almost pathognomonic value, and lays great stress upon it in the differential diagnosis. Very occasionally softness has been described which has invariably proved to be central caseous areas in large nodules. Cases in which soft areas were noted have been reported by Wyss, Wolff, and von Recklinghausen.

Cut Surface—To the practised eye are revealed spherical nodes—when these are of more than microscopic size,—varying from a granule to a filbert—exceptionally found as large as a goose-egg. Distinguishing features are often lacking. Sometimes of a reddish-gray color, these nodes contrast strangely with the prostatic tissue. The so-called cancer juice may at times be clearly demonstrated, but is frequently lost in the secretion of the gland.

Degenerative Changes—Although breaking down and ulceration occur in the later stages, carcinoma of the prostate does not tend to such changes, which are invariably the result of extension. When ulceration does take place it is usually towards one of the adjacent mucous membranes,—oftenest the urethra, then the bladder, less so the rectum. In the diffuse pelvic form, pronounced destruction may be found giving rise

to recto-urethral fistulæ, peritonitis, phlegmon, etc. Catheterization and instrumentation are held to play an important rôle in the production of degeneration.

Regional Invasion — While many of the older writers contended that a tendency to infiltration was characteristic of prostatic cancer, the opposite view is prominent of late. Englehardt maintains that local extension is not the rule, and Kaufmann, from an analysis of 100 cases, places its occurrence at about 57 per cent. Local metastatic dissemination appears in the form of small nodules beneath the mucosa of the urethra and vesical trigone and mouths of the ureters, into the seminal vesicles, less frequently into the rectum and pelvis. These processes rarely proceed beyond fixation of the mucous membrane. In only five cases did Kaufmann find vesical ulceration. Instances of metastases in the posterior portions of the corpora cavernosa of the penis have been reported.

HISTOLOGICAL ANATOMY

Several varieties of carcinomata have been described, but it is sufficient here to briefly remark on the three usually met with. The least common of these is, perhaps, the *adenocarcinoma*, then the *medullary* or *carcinoma solidum*, and (most frequent) the combined form. A true scirrhus cancer has very exceptionally been observed, and another rare species is that which Ciechanowski has styled, "*Adenoma destruens malignum*."

Adenocarcinoma resembles very closely the non-malignant adenomatous growth found in the so-called hypertrophy. In both there is builded glandular tissue lacking characteristic features. The alveoli in both may be distended with desquamated epithelial elements with central detritus-bearing areas. In carcinoma, however, there exists usually less space between the alveoli, the cell-nuclei stain deeper, and the lymph-spaces often contain cancer-cells.

Carcinoma solidum is characterized by the presence of areas of small round or cubical cells with large, deeply-staining nuclei. Large and small groups are found, and scattered cells

are often seen between the connective-tissue fibres and in the lymph-spaces

In the mixed variety the characteristics of medullary and adenocarcinoma appear in varying proportion. But while a pure medullary carcinoma is frequently seen, an adenocarcinoma without some traces of the former is rare.

In all varieties may be found areas of round-cell infiltration, as in hypertrophy, also nests of cancer-cells invading the lymph-spaces, the sheaths of the nerves, and the blood-vessels, particularly the veins. These are often found completely filled, their walls having been penetrated.

METASTASES

Unquestionably the most striking feature in the complex picture presented by primary cancerous disease of the prostate is found in its secondary metastases, which are at once peculiar, frequent, and profuse. Peculiar because, as a rule specific sites are chosen for metastatic invasion. Frequent, because it occurs in more than a majority of cases, and profuse, since secondary deposit is invariably far in excess and out of proportion to the primary growth. While the latter is usually small, the metastases from it are usually excessive.

The favorite metastatic sites are the bony skeleton and lymphatic glands.

Glandular involvement has been considered almost an unfailing sequence. Cone,⁸ on the other hand, from a study of the literature and of his own case reported from Halsted's clinic, concludes that the lymph-glands may not be involved. He found glands which were enlarged, but only one containing cancer elements. Kaufmann, who has more recently elaborated upon glandular metastasis, remarks on its infrequency when compared to carcinoma of other structures. In his twenty-two personal cases, it was met with in eleven (50 per cent.)

The glands usually invaded are the pelvic, the iliac, and the inguinal, also the mesenteric, hepatic, mediastinal, supra-clavicular, and axillary. In Kaufmann's 100 collected cases, the pelvic glands were involved in twenty-seven, the iliac in

twenty-four, and the inguinal in sixteen. Metastasis takes place through the lymphatic channels, and into the inguinal chain, probably secondarily from the pelvic glands or rarely from the corpora cavernosa, and not directly from the prostate.

Deposit in the Bones — It is generally conceded that carcinoma of bone is never primary, always secondary. The three chief sources of osseous cancer are primary disease of the breast, of the thyroid, and of the prostate. Of these, prostatic carcinoma is most prone to this remote extension.

Thompson was the first to record such a case in which numerous carcinomatous foci were found in the vertebræ. Little, however, was known or thought of this complication until von Recklinghausen in 1891 called attention to its frequency, and graphically described the morbid anatomy. Following the publication of his five cases many others have been reported, including the interesting one by Cone in this country. But the number of reported cases in no wise furnishes an idea of its frequency, because so seldom are the bones carefully examined at necropsy, the more true since usually they manifest but little or no external evidence of disease. Von Recklinghausen, in commenting on one of his cases, says that the bones would not have been examined had not one prominent surface bone (the frontal) presented a small tumor.

Conclusions drawn from an inspection of the bulk of cases in literature necessarily represent a low estimate. The earliest statistics are those of Wolff (1899), who found record of bone metastasis in nine of eighty-three prostatic cancers, 13 per cent. Kaufmann's figures (1902) are somewhat higher, 34 per cent in 100 cases. An accurate conception is only possible from a comprehensive calendar of cases, in each of which careful post-mortem sections, including skeletal examination, have been made.

The only list of such character at present obtainable is that by Kaufmann. In his twenty-two cases, secondary skeletal involvement was found in sixteen, 72 per cent. Whether such a high ratio actually prevails awaits confirmation. At any rate,

these figures indicate, as then compiler observes, a frequency far in excess of all imperfect notions previously held

Metastasis in the bones is, as a rule, more or less general. Rarely are only one or two bones affected. In this respect Cone's case is typical, with disease of three lumbar vertebræ, one rib, ilium, and tibia. In only one instance among Kaufmann's sixteen cases was but a single bone diseased. A predilection is observed for certain bones. The vertebræ hold first place as a favorite site (particularly the lumbar), then the ilium, femur, ribs, humerus, sternum, calvarium, tibia, etc. Of the thirty-four cases of skeletal metastases collected by Kaufmann, the lumbar vertebræ were involved in twenty-seven, the ilium in twenty-one, the femur in twenty-three, ribs in nineteen, sternum in twelve, skull in twelve, tibia in six.

Space forbids more than a brief consideration of the anatomic changes, for the details of which reference may be had to the excellent description given by Dr Sidney M. Cone (*Bulletin of the Johns Hopkins Hospital*, May, 1898, p. 114). Von Recklinghausen's belief, that the bone marrow is primarily the seat of deposit, is generally accepted as the true one. The soft parts of the bones are usually found invaded by small nodules of cancer-tissue histologically resembling the type of the mother-growth in the prostate. In the long bones these occur more frequently near the epiphyses,—in the vertebræ throughout the spongy portion of their bodies. This "osteoporosis," "myelogenous carcinomatosis," or "osteoklastic" process, often extends from the central canal to the periosteum, through the cancellous structure *via* the Haversian system, in which may be found nests of cancer-cells. Extension to the periosteum is productive of an "osteosclerosis," "fibroperiostitis," or "osteoplastic" process with the formation of new bone.

This osteoplastic process occurs most frequently in the flat and long bones, giving rise to irregularities and small tumefactions of their surface. Rarely, however, do more than one or two bones show such changes. New bone formation also occurs in the marrow.

These two processes—osteoklastic (called by von Reck-

linghausen "osteomalacia carcinose") and osteoplastic—are rarely productive of any great destruction of the bones, on the one hand, or of malformations or tumors of any size, on the other. The two largest tumors on record appear in Cone's case and in one by Kaufmann (see appendix). Spontaneous fractures have occurred in but one or two instances.

Von Eiselsberg's view as to the mode of transmission in carcinoma of the thyroid has been accepted in prostatic cancer. The veins are considered the source of dissemination. This thesis possesses probability, since phleboliths are common in the prostatic veins. But why the cancer elements (since they must pass to the right heart, through the pulmonary circulation and into the general arterial stream) should be deposited with such regularity in the bones instead of in the lungs or other organs is still obscure. Explanatory hypotheses include a chemical affinity on the part of the bone marrow, a mechanical entrapment, and Neusser adds a most ingenious theory based on the assumption of a "blood-relationship" between the mammæ, the thyroid, the prostate, and the bone marrow.

The marked similarity of secondary carcinoma of the bones from prostatic, thyroid, and mammary cancer is an interesting pathological coincidence which has baffled explanation. Carcinoma of the breast and of the thyroid choose with almost equal regularity the same bones as the prostate. In four cases of breast cancer with skeletal carcinomatosis, seen post-mortem by the writer, the vertebræ, ribs, femora, etc., were invaded, but in none was there any external evidence of disease. According to Limacher, this complication occurs in 37 per cent of cases of cancer of the thyroid. The rate in mammary disease is given by Lenzinger as 14 per cent. Skeletal cancer occasionally occurs in cancer of the uterus and of the stomach.

Internal metastasis is found with some degree of frequency. Specific selection of any organ or group of organs is lacking. Kaufmann places the occurrence of internal metastasis in about 25 per cent of cases. He found metastases in the liver, lungs, peritoneum, dura mater, pancreas, adrenals, spleen, thyroid,

endocardium, etc. These involvements are believed to be retrograde from the lymph-glands

SYMPTOMATOLOGY

The symptoms of carcinoma of the prostate, for the sake of clearness, may be classified as follows (1) Those due to the primary disease in the prostate, (2) those arising from local invasion or displacement of neighboring organs (principally urethra and bladder), (3) those produced by secondary disease of the bones, lymph-glands, and internal organs. It is significant that those belonging to the first group are sometimes absent or indistinctive, and invariably attributed to other causes, which is perhaps even truer of the metastatic phenomena for the reason that they are more or less identical with those of more common disorders, which often coexist, masking the more serious malady. While, generally speaking, the symptoms of prostatic cancer are lacking in distinguishing characteristics, one or two observers have pointed out that certain features are usually present which are of particular diagnostic value.

To avoid repetition, the signs and symptoms will be discussed as usually given and not as classified above.

Pain—Of first importance is that due to the primary growth in the prostate. This is more often vague and irregular, though in some cases dull and persistent. It may be referred to the perineum, rectum, glans penis, and often radiating to the hypogastrium, back, and thighs. Rarely severe, it may disappear for periods or altogether.

Secondary pain occurs as the result of glandular enlargement and disease of the bones. The former usually manifests itself as a sciatica, usually bilateral. Skeletal pain simulates the so-called chronic "rheumatic" pains of the old, for which it is usually mistaken.

While Belfield⁴ and others are impressed with the frequent painlessness of prostatic cancer, there are some observers who state that there are few cases which are entirely free of pain at one time or another,—few in which pain, though vague,

is absent in the early stages. Pain in the region of the prostate is certainly an important symptom, because usually the one guide leading to early diagnosis. Persistent pain in or about the prostate in elderly men, developing in the course of hypertrophy, should awaken a lively suspicion and call for careful investigation. The importance of this symptom is beautifully illustrated in Greene's case (see appendix), in which "operative procedures (prostatectomy) for the relief of pain became imperative," and removed what turned out to be an early carcinoma of the prostate.

The pain of cancer is to be differentiated from that of vesical calculus and tumor, prostatic stone and tuberculosis, of rectal cancer, of pelvic neuralgia, and prostatic neurosis.

Urinary phenomena are dependent upon elevation of the vesical outlet, or cancerous invasion of the urethra and bladder, or both. The former is rarely sufficient to produce symptoms except when combined with hypertrophy. Then micturial frequency, residual urine, and pyuria are usually present. Occasionally the displacement due to cancerous enlargement gives rise to some frequency and a small amount of residual urine. Vesical and urethral invasion only add symptoms when such results in ulceration with hæmaturia.

According to von Füssch, the urine in neoplasms of the prostate usually remains normal for a long time. Fenwick accords urinary symptoms in about 60 per cent of all cases. In the case of Sasse (*vide supra*) the urine was notably clear (normal).

Hæmaturia is given as occurring in 26 per cent of cases by Engelbach, in 37 per cent by Buickhardt. The blood either appears more particularly at the beginning, or at the end, of the stream, or thoroughly mixed in the urine. The hæmorrhage is usually continuous, though at times may subside. Occasionally it is profuse.

Retention of urine is rare, generally seen in large hypertrophy-cancer or diffuse cancer.

Rectal symptoms are infrequent. Constipation is met with in large growths, and hæmorrhage very rarely from ulceration.

Rectal Examination—Characteristic of carcinoma prostatæ to the exploring finger are hardness, tenderness, and a rough, nodular contour of the rectal surface and margins of the lateral lobes. Sometimes a single hard spot, a projecting node, or a lobulated surface or border of one or both lobes are distinguished. Irregular enlargement of one or both lobes is the rule. In hypertrophy-cancer, smooth, bulging expansion, in which more or less distinct dense, sometimes protruding, areas are found. Tenderness is rarely great, and is usually localized in the portion of the gland diseased. While these signs are sometimes with difficulty made out, von Frisch, Guépin, and others evince the belief that they are usually present, and when prominent are diagnostic.

Signs of extension into the rectum are found in fixation of the mucous membrane to the prostate, and in small shot-like nodes adherent to the mucous surface. Extension into the seminal vesicles can sometimes be demonstrated by their indurated, enlarged, lobulated feel. Diseased pelvic glands have been palpated (with the lower bowel empty) by sweeping the finger high up along the sides and sacral region of the pelvis. In diffuse pelvic carcinomatosis, indurated areas may be made out, extending outward from the prostate, which is more or less immovable, and when extensive, as Keyes²¹ remarks, "the finger abuts upon an enormous hard, nodular tumor."

Cystoscopic and Urethrosopic Examination—The cystoscope may reveal alterations in the contour of the vesical outlet and trigone, due to expansion of the prostate, and a nodular appearance of the infiltrated mucosa or ulceration may be seen. These signs are negative unless taken in conjunction with the symptom complex. The most positive one is, perhaps, the picture displaying a tubercled appearance of the mucous membrane of the vesical floor and ureteral openings. Even then correct interpretation is often difficult.

Endoscopic pictures of the intrapelvic urethra may evidence ulceration, deep excavation, papillomatous formation, or a normal mucous membrane. According to von Frisch¹³ such findings in themselves are of little diagnostic value. The

urethroscope is perhaps of value in determining the question of urethral involvement

Cachexia is an uncertain symptom except in the very late stage of the disease. It is usually more prominent when metastasis is extensive and quite out of proportion to the size of the primary growth. Occurring in old men and in old "prostatics," it is often masked by the emaciated senile skin, and mistaken for the septic appearance due to prolonged urinary infection

The glands, other than those deeply seated, are occasionally enlarged. Most commonly seen are those of the inguinal region. Usually bilateral, they indicate metastasis from the pelvic glands. Supraclavicular and axillary enlargements have been noted. Carlier reports a conspicuous case of the former, adding that supraclavicular gland tumor, especially of the left side, in doubtful cases of prostatic enlargement, points to a diagnosis of prostatic carcinoma

The Bones —Secondary tumors are rare, clinically, because so seldom of more than moderate size, they are usually undemonstrable unless very superficially situated. Only a few cases are on record. Von Recklinghausen reports one of the frontal bone, Cone, one of the tibia, and Kaufmann, one of the ilium. It is instructive that the two former were diagnosed osteosarcoma and operated

Examination of the bones, particularly the ribs, may reveal spindle-shaped, tender swellings. Tenderness over the bones, especially the spines of the vertebræ, is given as an important symptom. Radiographs are of questionable value, although the scant clinical data does not permit decision on this point. Kaufmann in several cases reports negative results

The Blood —In carcinoma of the bones, particularly when the bone marrow is infiltratingly diseased, and many and large bones are affected, it would be natural to expect to find alterations in the blood-findings, notably in the elements of supposed myelogenous origin. Such is unquestionably the case in many instances. Braun⁵ gives a case in which poikilocytosis was marked and myelocytes (largely eosinophilic) and normoblasts

were present. Turk, in Neusser's clinic, diagnosed a case^{*} of skeletal carcinosis in breast cancer from the finding of considerable numbers of nucleated red blood-corpuscles and myelocytes in the blood. The autopsy (seen by the writer) was confirmatory. The majority of the vertebræ, as well as several other bones, were diseased. The hæmatology of carcinomatosis of the bones has been recently studied at some length by Kurpjuweit,²² who believes that blood changes are early and constant features, so much so that diagnosis may be made without the supplemental evidence of a primary tumor. According to his observations, the appearance of considerable numbers of myelocytes is characteristic, and upon this is based the diagnosis. He recites thirteen cases upon which his assertions are founded, including earlier cases by Braun, Ehlich, and Epstein.

Bence-Jones albumosuria has been mentioned as a symptom of myelogenous carcinosis, but some doubt seems to exist in this regard. While a few vague statements to the contrary are to be found, Dr Parkes Weber,³⁰ of London, who has carefully reviewed all the authentic cases of Bence-Jones albumosuria in literature, is emphatic in declaring that "Metastatic tumors affecting the skeleton, however extensively the bone marrow may be infiltrated, have never yet been known to cause Bence-Jones albumosuria."

Paraplegia has occurred in patients afflicted with prostatic carcinoma with sufficient frequency to demand notice. Thompson observed a case which was due to a small tumor of a vertebræ pressing on the cord. Nélaton records a similar case. Another interesting case by Burckhardt (see appendix) revealed a metastatic mass in the spinal dura, the size of a cherry. Belfield mentions a recent fatal case without autopsy.

Diagnosis—Wolff has pointed out the difficulty of diagnosis, and von Frisch has given practical expression of it when, in reporting his twelve cases of malignant disease of the prostate in his clinic during ten years, he says that the majority

^{*} Billings and Capps (*The American Journal of the Medical Sciences*, September, 1903) mention this case, and discuss osseous carcinoma in the differential diagnosis of myelogenous leukæmia.

were diagnosed either at operation or at necropsy. The fact is, that the recognition of prostatic cancer depends upon phenomena which may often escape observation and readily avail of misinterpretation. It is particularly unfortunate, since the prostate and its neighboring structures are subject to frequent affections possessing great similarity and often concurrent. Of this hypertrophy is a prominent example. But more significant is the fact that the physical signs depart so widely from those popularly held as characteristic and only too often made the chief diagnostic features of cancer and malignant disease in general, namely, the positive, though varying, increase in size of the primary neoplasm, its inevitable octopus-like grasp upon the surrounding parts, and its final destructive ulceration. Little wonder is it then that this disease in the past has so frequently evaded detection during life. Yet upon a better understanding of the morbid anatomy and symptomatology, and with more acute and intelligent clinical observation, it would appear as though cancer of the prostate should be recognized with greater certainty, and frequently before the stage of metastasis.

While the attention is often called to cancerous disease of the prostate by the symptoms of its metastases, the diagnosis assuredly depends upon prostatic symptoms, not so difficult in the small minority of cases in which growth is progressive and tumefaction grossly obvious, often tentative in the larger number of cases in which the prostate is moderately altered, and often impossible—it would seem—in those few in which the external configuration of the gland is unchanged.

Upon the data at present obtaining, early recognition is dependent upon three not wholly satisfactory phenomena, and these three alone, to wit: Pain in or about the prostate, areas of hardness and nodosity palpable from the rectum, and tenderness. Whether all of these, or the second and most valued one alone, suffice must await future proof. In this connection Greene's case is instructive, for, with a suspected stone or cyst of the prostate associated with pain, a cancerous prostate was removed undoubtedly early and apparently before metastasis.

The diagnosis does not rest with the suspicion or demonstration of prostatic cancer. In view of the prognosis and of possible operative interference, the diagnosis of metastasis, so far as is possible, is paramount. The urine and urinary tract require investigation. Clear urine does not mean vesico-urethral freedom from invasion. Hæmaturia signifies urethral or vesical ulceration, more often the former. Rectal examination is necessary to determine, if possible, whether the rectal mucous membrane is adherent to the prostate, pelvic glandular enlargement, and suspicious induration from the prostate laterally and towards the seminal vesicles. Observations should also include the skeleton, the blood, and the superficial lymph-glands, more especially the inguinal, supraclavicular, and axillary.

Differential Diagnosis—Carcinoma of the prostate is to be distinguished from hypertrophy, stone, cyst, tuberculosis, neuralgia, and abscess of the prostate, from vesical neoplasms and cancer of the rectum. Hypertrophy has been most frequently mistaken for cancer, because both occur at the same age, because both are characterized by moderate enlargement of the prostate,—often coexistent,—and because of the tendency to call all enlargements in mature men hypertrophy.

The following case is of interest from a diagnostic standpoint, although only probable because uncorroborated by autopsy. This patient I only saw once just before his removal to a distant town, where he soon afterwards died.

J. E. A., sixty-nine years, American, single. Aside from urethritis at twenty had always enjoyed splendid health and strength, having led an active life in many parts of the world. Disease during childhood unrecorded. Luetic infection denied. During the past one and one-half years has suffered pain referred to the rectum, sacrum, and hips. More recently pain in the back, shoulders, and back of neck. These pains have never been severe, though more or less constant. Upon medical advice has conscientiously followed treatment for rheumatism. During past few months has lost considerably in weight. Interrogation elicited nothing further than a long-standing chronic cough, until one

week ago when he "took a cold which settled in the chest," for which consultation is sought

Status Præsens—Man of large frame and advanced age, in bed, though able to sit up and move about. Emaciation marked and skin of cachectic appearance. Pulmonary signs of emphysema and subacute bronchitis. No evidence of pneumonic consolidation, fluid or tuberculous process. Temperature, 99° F, pulse, 78, respiration, 22. Mucous membranes pale. Heart sounds weak. Arteries thickened. Examination of abdomen and extremities negative. Urine clear, examination negative. Rectal examination. Prostate asymmetrically enlarged, left lobe of normal size, shape, and feel, right lobe irregularly enlarged, lateral margin lobulated, and rectal surface corrugated, with prominent nodule of the size of a hickory nut and of extreme hardness. Rectal mucous membrane non-adherent. Entire right lobe moderately sensitive to pressure. Further rectal examination negative (no glandular enlargements or areas of induration felt). Examination of superficial glands negative. Palpation of back for source of pain brought out marked tenderness to pressure upon the spines of the vertebræ, particularly the cervical and lower dorsal. Flat, ovoid, hard swelling felt over the outer surface of the right ilium just below the crest. Further careful examination of skeleton negative, except for slight tenderness over sternum. Catheterism and urethral instrumentation not attempted.

Blood examination. Hæmoglobin, 60 per cent. Estimation of erythrocytes and leucocytes not made. Nucleated red blood-corpuscles (normoblasts) averaging two to the field. Myelocytes in the proportion of one to every three leucocytes to the field. No poikilocytes.

Prognosis—Carcinoma of the prostate has been classed among the highly malignant and rapidly fatal neoplasms, the duration varying from six months to two years, rarely longer. Its malignancy is displayed, however, rather through extensive metastatic colonies than in the small primary focus.

It is reasonable to suppose that the primary growth itself is, as a rule, a slow process, which would be years reaching a sufficient local growth to cause death were it not that metastases

in the bones, lymph-nodes, and internal organs invariably supervene. The advent of secondary involvement, in amount often many times that of the parent growth, naturally shortens the course of any growth, no matter what may be the degree of its malignancy.

Based upon the morbid anatomy, the operative prognosis is governed not only relatively by the extent of regional growth, but absolutely by secondary remote involvement. Theoretically, removal of the prostate in early cases should result in radical cure by reason of its tendency to remain sessile and embedded within the gland. While the operative experience of forty years, beginning with Billroth in 1859, has been a record of failure so uniform that a stigma has been placed upon surgical intervention amounting to a general, often bitter, condemnation, it has only proven what pathology is ever teaching, namely, that excision of mature malignant tumors can rarely, if ever, be complete. It is noteworthy that in the cases reported during this period no mention is made of early diagnosis. Maturity and metastases were undoubtedly the rule, usually known or suspected by the operator, and evidenced by the symptoms described. As in the early case of Billroth, disease of the bladder or other structures were frequently demonstrated during the operation.

However, to-day a new aspect has been given this subject and a brighter outlook is promised, not alone from pathological study of prostatic cancer, but in recent statistics of operation. That early operation should be curative is given confirmation in Oraison's report of twenty-three cases from the French clinics in which perineal prostatectomy was done. In ten of these (43 per cent) cure has remained permanent after more than four years, in three only was there recurrence. Six others recovered, but were lost sight of, the remaining four died from the operation.

These figures are certainly most encouraging, and compare favorably with those of cancer of other organs, though hardly surprising, in lieu of the anatomic fitness of uncomplicated prostatic cancer for complete removal. The fact that this

applies only to early disease must not be lost sight of. In late carcinoma of the prostate, as in few other forms of malignant disease, is the prognosis graver. It is upon such cases that the bane of surgical interference must fall. A regret it is, that many of the cases are not seen, or are not recognized until metastases have set in.

Treatment—Until the cancer problem has been solved, the treatment of malignant disease wherever encountered must of necessity be empirical. The exigencies of the times include radical operative measures, palliative operations, Röntgen therapy and symptomatic treatment.

The application of radical surgery, at least its scope as a curative measure, must be governed by anatomy of the part and the habit and peculiar features of cancer in local and remote development. Thus in carcinoma of the breast, where lymphatics are numerous and the pathways of early extension to the axilla, to the neck, through the chest wall to the pleura and mediastinum, extensive and early operation is demanded, for success is dependent on removal of lymphatic channels before the penetration through the chest wall and to the deep cervical glands. In like case is carcinoma cervicis uteri, but not so prostatic cancer. Firstly, is the prostate poor in lymphatics, secondly, is cancer not given to diffuse lymphatic dissemination, and thirdly, is the anatomy such that removal of the prostate with surrounding structures becomes impossible. On the other hand, as detailed above, carcinoma prostatae tend to confined local development, but to diffuse distant metastases. Were the regional conditions the same as in mammary disease, then would prostatic cancer be inoperable in any stage. The redeeming feature lies in the fact that, in a region where operative measures are limited, the extent of the primary tumor is also limited. In carcinoma of the prostate, the requirements of surgical intervention are early, but limited removal of the puts and success are subject to its accomplishments before extraprostatic invasion has taken place.

Radical Operation—The general prejudicial teachings and the statements that prostatectomy for cancer is "little short

of a calamity" and "absolutely contraindicated"—while based on results, and conserving against the misuse of surgery—are backward leanings and not borne out by pathologic study or recent surgical experience. And yet it would be vicious and disastrous to revert to the other extreme, for there are many cases in which it would indeed be a calamity (except as a judicious palliative measure) to apply surgical intervention. Anatomically, the line of distinction between clearly operable and grossly inoperable is most finely drawn. Furthermore, as in few diseases, are we so reliant upon the presence or absence of *contraindications* in determining the question of operation.

The indications for operation are found (1) in the presence of cancer, (2) in the demonstration that it is not of long standing, and (3) (most important) the absence of signs of regional and remote metastasis. The recognition of cancer has already been discussed under diagnosis. The determination of the period of the disease is difficult, often impossible, revealed sometimes by the date of beginning pain, rarely by the size of the prostate, more accurately by the presence of metastases, the symptoms of which form the chief factors contraindicating operation.

Contraindications—Under this heading will not be considered the rules governing operation in general, but only those signs which bear witness of secondary malignant complications by reason of which radical operation is obviously prohibited. These as shown in the symptomatology, include the manifestations of carcinosis of the skeleton, of the glands, of the seminal vesicles, rectum, bladder, and pelvis.

The question of operation, because of the difficulty of diagnosis not only of the primary but metastatic disease, must often be made (even under improved clinical methods) problematic so much so that the contention must be raised, Is it possible in any case to be sufficiently positive of early and uncomplicated prostatic carcinoma to justify operation? Answer to this question must await future clinical experience. One impressive example in the affirmative is given in Greene's case (see appendix). For the present, opinion must differ,

on one hand scepticism, the result of current prejudice against operation born of past failures, on the other, an optimism, sanctioned by pathological study and encouraging clinical results

Our attitude should be broadened by a study of the position of surgery in malignant disease

History is replete with instances of the shortcomings of surgery and of unwise conservatism, which have been responsible for a goodly share of the failures and the discouraging statistics. Under the guise of conservatism, there has been, and probably will be, that hesitancy, in the face of suspected and even certain malignant disease, which vacillates in order to make sure of the diagnosis and avoid error by observing its growth, and that tendency to doubt and to wait until action is the only thing left to do. Conservatism in the treatment of malignant disease, as conservative surgeons have constantly declared, is to be found in early and complete excision. It even goes farther than this, as exemplified in the recent plea of Dr Maurice H. Richardson²⁷ under the formula, "Neoplasms wherever situated, should, if possible, be removed, whatever their apparent nature." Such wise radicalism can alone limit the extent and mutilation of operative procedures and better their results.

Operative procedures have undergone retrograde modification from extensive pelvic ablation to intracapsular prostatectomy. Socin resected the coccyx and divided the anterior and posterior wall of the rectum. Rydygier used a long incision at the border of the sacrum, and Kuster devised a combined suprapubic and perineal operation for removal of the bladder and prostate *en masse*. Zuckerkandl and Dittel recommended exposure of the prostate and seminal vesicles by a wide perineal incision. The results of operations undertaken in the past upon cases of obvious extensive growth have rendered all methods obsolete, so that no particular fashion of procedure is now recognized. The few who venture a word dismiss the subject of radical operation with the statement that removal is by prostatectomy as done for hypertrophy. The French

school have adopted the extra-capsular method of Proust and the more popular subcapsular method of Albarran. While enucleation of the prostate in a general way suffices to fill operative requirements, because operation is only admissible when the disease is supposedly limited to the prostate, to apply such procedure thus blindly and empirically is irrational on account of the impossibility of being sure of the exact extent of the disease. For this reason, procedure should first of all be exploratory, designed to permit of operative diagnosis before removal is attempted, in order to decide with more accuracy the actual degree of local involvement, the feasibility of continuing, together with probable prognosis. To this end the prostate may be thoroughly exposed by one of the various transverse perineal incisions and the bladder opened above. Upon exploratory findings must procedure be guided. From past experience, it would be folly in the presence of vesical or pelvic invasion to remove the prostate, except as a palliative measure for the relief of severe pain or urinary obstruction. If, however, extraprostatic disease is not manifest, prostatectomy should be proceeded with, though not, perhaps, by the usual methods, because here, again, conditions vary—altering operative requirements. Pathological anatomy teaches us that carcinoma may be situated in a portion of one lobe or more or less scattered throughout the recto-urethral portion of the prostate. Theoretically, then, when the first condition exists, partial prostatectomy, enucleation of one lobe, is sufficient, when the second obtains, the usual prostatectomy (either suprapubic or perineal) with removal of the retro-urethral or surgical prostate is enough, when urethral invasion is present, excision of the entire gland with the prostatic urethra is demanded. A discussion of the methods of carrying out these various degrees of prostatectomy is out of place here, except for a word in regard to total enucleation. This has been very easily (more so than in partial prostatectomies) and successfully accomplished by dividing transversely the membranous urethra and, as in all prostatectomies, intracapsular enucleation, which by said urethrotomy is greatly facilitated. The membranous

urethra below may be approximated with the vesical outlet. Before the wound is closed, digital examination of the seminal vesicles and pelvis should be made, merely to satisfy the mind of the operator concerning the possibility of their involvement.

While the method of operative procedure best suited to early carcinoma of the prostate must be evolved by future work, total enucleation (urethriprostatectomy) would seem most appropriate because less difficult, and in view of the nature of the disease most complete. Certainly, methods of prostatectomy which deny sufficient exposure for thorough exploration are blind and unfit in prostatic cancer. Regarding urethroprostatectomy, it is interesting to learn that Mr. Moynihan,²⁴ of Leeds, has recently reported a brilliant series of cases carried out by the suprapubic route for obstructive hypertrophy.

Palliative surgical measures have been recommended with due caution (1) in the form of prostatectomy, as a means of prolonging life and as a measure of last resort for the relief of pain, and (2) for the relief of urinary obstruction and infection. Removal of the prostate for the purpose of delaying the inevitable has been vociferously condemned despite the fact that Billroth, Czerny, and others have shown a lengthening of life from one to two years. Most recent observations refer to this practice as questionable except in rare cases.

Prostatectomy for the relief of pain is justifiable in those few cases in which pain is severe and medical relief ineffectual. Harrison mentions such a case (see appendix), the patient beseeching operation, which was followed by relief to the sufferer.

Urinary obstruction sometimes requires surgical intervention in the form of suprapubic cystotomy for permanent drainage. Rarely is perineal drainage used because of the interposition of the diseased prostate.

Röntgen-ray therapy has not as yet proved its usefulness in deep-seated tumors. Although untried in prostatic carcinoma, its value is doubtful, more particularly because this gland is enclosed within the bony pelvis, though this disadvantage may

be obviated by treatment from below. HARRISON hesitatingly urges its use as a possible curative or palliative measure, and has placed it on trial in several cases. Unable so far to draw any conclusions, he has observed relief of pain with no ill effects. This treatment is worthy of a fair trial, for the prostate is not so deeply placed per perineum.

Symptomatic treatment is directed to controlling the pain and urinary complications when they are present. For the former, opium in suppositories may be used as well as in other forms.

The treatment of urinary complications requires careful consideration in that the trauma of instrumentation may lead to destructive ulceration of the urethral and vesical mucosa. Instrumentation should be avoided in cancer of the prostate especially when advanced. Fortunately, it is rarely necessary. Catheterism is to be delayed and shunned if possible. For cystitis and continued hæmaturia, irrigation by hydraulic pressure will usually suffice. In the event of failure to wash the bladder by hydraulic lavage or by soft catheter, rather than resort to the constant use of a rigid catheter, it may, perhaps, be best to establish permanent suprapubic drainage. For cystitis, the internal remedies have their restricted usefulness, and systematic lavage of the bladder is indicated according to the degree of infection. In ulcerative and gangrenous cystitis, more effective drainage is necessary. For hæmaturia, adrenalin works benefit.

Summary—After scrutinizing closely and in more or less detail the subject of primary carcinoma of the prostate from different view-points, the picture exhibited may be thus briefly described. Occurring in the latter third of life, and in the normal, hypertrophied, or atrophic gland, prostatic cancer is characterized by restricted local growth, by deposits in the urethra, vesical trigone, seminal vesicles, and pelvic lymph-glands, and by diffuse metastasis in the marrow of the bones of the trunk in the form of osteoklastic and osteoplastic carcinosis. Symptomatic of the prostatic tumor are pain, tender and hard nodosity of the gland, and in hypertrophy-cancer the

phenomena of urinary obstruction. Signs of metastases are found in certain urinary symptoms, as hæmaturia from ulceration of the prostatic urethra, in enlarged pelvic and inguinal glands, and in pain, tenderness, and small tumors of the bones with myelocytosis and qualitative alteration in the erythrocytes. Of the diseases with which confusion is possible are simple enlargement, stone, cyst, neuromas, and inflammation of the prostate, also cancer of the rectum and bladder, vesical stone, etc. The prognosis, invariably most grave when untreated, from an anatomic stand-point and from recent operative experience, is better than in many malignant diseases with radical surgical treatment.

The treatment of carcinoma is, in early cases, by radical surgical intervention, in cases with vesical, glandular, and osseous metastases, strictly palliative and symptomatic. Radical operation consists in prostatectomy and, because of the nature of the disease, a urethrostomy, preferably by the combined suprapubic and perineal method, so designed that exploration for an accurate operative diagnosis may precede enucleation.

In Conclusion—It has been the object of this paper to assemble all the available facts and creditable theories concerning carcinoma of the prostate. This has been attempted because (as proemially stated) many of the modern books are in traditional error, because during the past few years definition has been given to an indefinite pathology, and because at this time, when much is being written about prostatic hypertrophy, little notice has been taken of cancer.

A study of carcinoma prostatae leads to many conclusions, of which the following may be premised.

1. That this disease is sufficiently common and so frequently unrecognized—mistaken for simple enlargement—as to actuate more intelligent and accurate clinical observation upon all elderly men. Exclusion of cancer and watchfulness of its development in all cases of hypertrophy are indicated. The doctrine that "Prostatic hypertrophy is at all times easy of diagnosis" should be modified.

2 That cancer of the prostate is most distinctly operable before metastasis has taken place to regional or remote organs, and as distinctly inoperable after secondary vesical, glandular, and skeletal invasion. That the high percentage of operative cures reported from the French clinics presages a promising future.

3 That radical operation should prescribe liberal perineal exposure of the prostate with preliminary exploration of the bladder and periprostatic structures, and total intracapsular enucleation—urethrioprostectomy. Prostatectomy *per se* is prociustean.

4 That there is opportunity for further pathological investigation,—particularly the careful post-mortem examination of all senile prostates,—for systematic clinical observation, and for operative improvement. It will be interesting to become better acquainted with the actual frequency of prostatic cancer, with the possibilities of early diagnosis, with the osseous phenomena and blood changes and with the possibilities of surgery as a radical curative measure.

APPENDIX

The following cases in abstract are appended in order to illustrate as comprehensively as possible the various points in the foregoing text. These particular ones are chosen because collectively they bring out both the common and bizarre phenomena, and because the data in each are quite complete.

1 CASE by SIDNEY M CONE from the clinic of Dr W S Halsted—Aged seventy-five years, white. Entered hospital complaining of painful swelling over right tibia and symptoms of cystitis for which he had been treated and discharged improved a year previous. "Notes made at this time by Dr Young refer to the great enlargement of the prostate and probable existence of a tumor. Careful examination excluded the existence of a tumor of other organs." Amputation by Dr Halsted was followed by uneventful recovery and dismissal of patient to home. The operative diagnosis was held to be that of carcinoma rather than sarcoma, and so proved by the microscope. Six months later patient had lost thirty pounds, was much emaciated, but cystitis much improved. Death seven months after operation.

Autopsy—Prostate much enlarged, measuring six by five by five centimetres. Lateral lobes symmetrically enlarged. Middle lobe enlarged. Nothing distinctive on cut surface.

Regional Metastasis—Backward from the lateral, particularly the middle lobe, is a mass spreading into the seminal vesicles, absence of urethral and bladder invasion, “prostatic and hæmorrhoidal veins plugged with phleboliths”

Remote metastasis was found in the bones, namely, lumbar vertebræ, second rib, ilium, osteoplastic carcinosis of tibia (amputated), second rib and ilium. Glandular metastasis was noticeably absent, except in one bronchial gland. No internal metastases.

In microscopic appearance, the tumor in the prostate, bones, and bronchial lymph-gland was sufficiently similar to conform to one description in which two appearances were presented, “first, a tubular adenomatous growth, cystic in places, second, a conglomerate mass of cells which have lost their arrangement in tubules,” resembling round-cell infiltration.

2 CASE by R. H. GREENE—Aged fifty-nine years. Gonorrhœa forty years previous. No urinary disturbance since, except slight burning at micturition during past few months. After indulging freely in champagne, retention developed, relieved by catheterization. Function returned. From this time on suffered pain in region of prostate and rectum. Seen by Dr. Greene three months later.

Examination—Well-nourished man, residual urine small, urine negative, apparently no third lobe enlargement, right lobe slightly enlarged by urethral examination (rectal examination negative). Treated by tonics, sedatives, and irrigations without effect. Patient complained of pretty constant pain and much depressed by it, so that operative interference for its relief became imperative. Diagnosis at the time probable encapsuled abscess or stone of the prostate. Operation (prostatectomy by the Alexander method) was successful, though convalescence delayed on account of a small recto-urethral fistula. Pathological report by Dr. Hailow Brooks: In the left lobe, moderate connective-tissue hyperplasia and small areas of round-cell infiltration, in the right lobe “a nodule of more compact structure than the surrounding tissue and measuring about five centimetres in diameter.” “The nodule of compact tissue is made up of islands of proliferating epithelial cells. This growth is adenocarcinoma.” Apparently it has been of rather recent formation.

3 CASE by REGINALD HARRISON—Professional man, aged sixty-one years. Complained of frequency of micturition. No residual urine. Prostate by rectal examination was found to be large and hard. “It was noted, however, that the rectum was freely movable over it, and that the growth was not unduly fixed within the pelvis.” Patient was not seen until nine months later, when micturial frequency had so increased, and with it the necessity for catheterization, that operation was urgent and suprapubic prostatectomy performed. What was apparently a fibro-adenoma was enucleated with some difficulty. Evidence of bladder distention found and ureteral orifices were patent to the finger. Gross appearance of the tumor was that of adenoma, which the first microscopic examination supported. A further examination unmistakably indicated its carcinomatous nature. Three months after operation patient was in excellent health and passing

urine quite naturally One month later had slight attack of hæmaturia One year later the abdominal cicatrix and contiguous glands had largely become involved in carcinoma, with œdema of legs and scrotum

4 CASE by REGINALD HARRISON—Patient, aged sixty-four years, complained of frequency of micturition with occasional dribbling Catheter had previously been passed,—no residual urine History of former renal colic with passage of gravel "Examination by rectum showed the prostate to be extremely hard, particularly at one point, where it had the sensation as if a stone was impacted there" Patient complained of dull aching about the buttocks and thighs "He was losing flesh" Later increase in size and hardness of the prostate necessitated catheterism "Occasionally a few drops of blood were passed" No enlarged glands in loins or femoral regions detected Patient urged operation for pain "I gave it as my opinion that the case was an unfavorable one for prostatectomy, as it was not unlikely the growth would recur, and there was no guarantee that the whole of the disease could be removed" It could not be denied that the growth might not be of one of those densely fibrous prostates, though the weight of evidence was against this However, at patient's request, operation (suprapubic prostatectomy) was performed Prostatic mass could not be enucleated entire, but was removed in portions Patient received immediate relief, but progress was disappointing Recurrence and death followed in four months "Secondary growth manifested itself in the spine about the ninth and tenth dorsal vertebræ" Microscopical examination of prostate "The periphery of the mass was adenomatous, whilst the centre was carcinomatous" The growth cut like scirrhus of the breast and yielded cancer juice

5 CASE by EDUARD KAUFMANN—Aged seventy-three years Duration of illness, several months Symptoms Pain in back and abdomen, tenderness on pressure over lower portion of the crest and over the spinous processes of the lumbar vertebræ Absence of vesical or rectal symptoms, increasing debility Post-mortem examination of prostate, Both lobes slightly enlarged and irregularly nodose, the left about the size of a pigeon's egg and very hard, with smooth, grayish cut surface, dotted with white spots, the right lobe smaller, nodular, hard, with only one yellowish-white spot of the size of a pea upon the gray cut surface Microscopical diagnosis Adenocarcinoma with transition into carcinoma solidum Complicating diseases Hypertrophy and dilatation of the heart, double-sided hydrothorax, emphysema, and bronchitis Metastases of neighboring organs Small nodes in the bladder and pinhead nodules in the rectovesical pouch Metastases in the glands Pelvic, retroperitoneal (as far as kidneys and spleen), mesenteric, inguinal (pea-size) and left supraclavicular (walnut-size) In the right femur (upper fourth) distinct cancer islands of size of hazel-nut (In the ribs and lumbar vertebræ numerous fibrocartilaginous exostoses, non-cancerous)

6 CASE by EDUARD KAUFMANN—Aged sixty-seven years Duration of disease, nine months Symptoms Pain in right thigh in region of sciatic nerve, rapid loss of strength Clinical diagnosis Chronic rheumatism Examination of prostate at autopsy very hard, both lateral

lobes as large as a hen's egg, yellowish-white cut surface, porous in places Middle lobe prominent, with two projections into the vesical trigone, and tubercled appearance of mucous membrane and of prostatic urethra Microscopic diagnosis Carcinoma solidum with cubical character of cells In part exquisite infiltration with penetration into the blood-vessels Regional metastases In the bladder and urethra (fine nodules), in the seminal vesicles and vasa deferentia Remote metastases Lumbar vertebræ, ribs, femur, humerus, clavicles, and skull (osteoplastic), glands around the aorta at the level of the kidneys, left kidney and adrenal, liver and pleura

7 CASE by EDUARD KAUFMANN—Aged forty-eight years Duration, eighteen months Symptoms. Pain in sacrum, in both knees, headache, and vertigo, liver enlarged to four fingers'-breadth below costal margin, hard, granular, and tender, left hip tender to pressure, gait paretic, plantar and patellar reflexes abolished, increasing weakness Clinical diagnosis Carcinoma of lumbar vertebra (?), of liver, and spleen Post-mortem examination of prostate Right lobe as large as a plum, with soft, white nodes, left lobe similar Complicating lesions Hæmorrhagic pleuritis (left), pachymeningitis hæmorrhagica, emphysema, and bronchitis Metastases Lumbar vertebræ, femur, ribs, pelvis, and humerus (osteoplastic), retroperitoneal, mesenteric, bronchial, and mediastinal (size of fist) lymph-glands, liver, lungs, pleura, and kidneys

8 CASE by EDUARD KAUFMANN—Aged seventy-two years Duration, several months Symptoms Rheumatoid pains in sacrum and thighs, diffuse intrapelvic pain, frequency of micturition with cloudy urine and catheter-life, hard tumor of uncertain contour over crest of ilium (left), skiagraph negative, increasing loss of flesh, later, nodes in pelvis and fracture of clavicle Clinical diagnosis Carcinoma of the prostate, rectum, and the bones Prostate at autopsy The size of one's fist and hard, right lobe completely carcinomatous, in left some prostatic tissue remaining Microscopic diagnosis Carcinoma simplex solidum Local metastases Invasion of neck of bladder, mouth of right ureter surrounded by ulcerated tumor mass, nodes in corpus spongiosum, corpora cavernosa, and sulcus coronarius, of penis, seminal vesicles, rectum, and rectovesical pouch infiltrated with nodules, general invasion of pelvic veins Distant metastases Iliac, sacral, and periaortic glands (small and hard), left inguinal markedly enlarged, os ischii (tumor as large as child's head), left scapula and clavicle (fractured), one rib (fractured), left tibia and fibula, and calvarium (in part osteoplastic), pancreas and dura mater cerebralis

9 CASE by EDUARD KAUFMANN—Aged fifty-eight years Duration of illness, one year Symptoms Pain in sacrum Prostate post-mortem Left lobe somewhat hard and slightly enlarged, with isolated nodules projecting from the cut surface, right lobe rather soft with one very hard, extremely prominent node Complicating lesions Apoplexia vetus and a cloudy and fibrous degeneration of the myocardium Metastases Pelvic glands (size of nuts), vertebræ, pelvis, ribs, and sternum (osteoplastic)

IO CASL by EMIL BURCKHARDT—Aged seventy years Several years previous perineal prostatectomy had been done and a year and a half later castration Two years after last operation paraplegia set in, preceded by lancinating pains and spastic contractions in both legs Death occurred four weeks later from pneumonia Autopsy A cancer node in right lobe of prostate (size of filbert), a pea-sized node in left lobe A markedly protruding middle lobe as large as a pigeon's egg, totally carcinomatous Both seminal vesicles invaded Skeletal metastasis Vertebrae, left ilium, right femur, sternum, and right humerus Glands Pelvic, retroperitoneal, and inguinal Also pleura and spinal dura mater In the latter, a node as large as a cherry at the level of the first lumbar vertebra, with degeneration of the cord at this point and cancerous invasion of the first right lumbar nerve

LITERATURE

- ¹ Albarran, J, and Halle, N Hypertrophie et neoplasies epitheliales de la prostate Annales des maladies des organes genitourinaires, February and March, 1900
- ² Belfield, W T Diseases of the Prostate Morrow's System of Genito-Urinary Diseases, Syphilology, and Dermatology, Vol 1, 1893
- ³ Belfield, W T Progressive Medicine, December, 1900
- ⁴ Belfield, W T Progressive Medicine, December, 1903
- ⁵ Braun, L Ueber osteoplastisches Carcinom der Prostata, zugleich ein Beitrag zur Genese der perniciosen Anemie Wiener medizinische Wochenschrift, 1896, Nos 13 and 14
- ⁶ Burekhardt, Emil Die malignen Neubildungen der Prostata Soem and Burekhardt's Die Verletzungen und Krankheiten der Prostata, Stuttgart, 1902
- ⁷ Ciechanowski, S Ueber die sogenannte Hypertrophie der Vorsteherdruse und ueber anatomischen Grundlagen der senilen Insufficienz der Blase Centralblatt fur Chirurgie, 1896, No 32
- ⁸ Cone, S M A Case of Carcinoma Metastasis in Bone from a Primary Tumor of the Prostate Bulletin of the Johns Hopkins Hospital, May, 1898, Vol 12
- ⁹ Giandon, L R G The Pathogenesis and Pathological Anatomy of the Enlarged Prostate From the pathological laboratory of the Boston City Hospital, ANNALS OF SURGERY, December, 1902
- ¹⁰ Engelbach, P Les tumeurs malignes de la prostate These de Paris, 1888
- ¹¹ Fenwick, E Harry Primary Malignant Disease of the Prostate Gland Edinburgh Medical Journal, 1899, p 16
- ¹² von Frisch, Anton Die Krankheiten der Prostata Wien, 1898
- ¹³ von Frisch, Anton Klinische Untersuchungsmethoden Frisch and Zuckerlandl's Handbuch der Urologie, Vol 12
- ¹⁴ Greene, R H, and Brooks, H The Nature of Prostatic Hypertrophy The Journal of the American Medical Association, April, 26, 1902
- ¹⁵ Greene, R H Cancer of the Prostate New York Medical Journal, October 24, 1903

- ¹⁰ Guepin, A Cancer de la prostate Presse médicale, 1896
- ¹¹ Harrison, Reginald Remarks on Cancer of the Prostate and the Selection of Cases for Suprapubic Prostatectomy The British Medical Journal, July 4, 1903
- ¹² Julien, Louis Contribution à l'étude clinique du cancer de la prostate Thèse de Paris, 1895
- ¹³ Kaufmann, Eduard Pathologische Anatomie Socin and Burckhardt's Die Verletzungen und Krankheiten der Prostata, 1902
- ¹⁴ Kaufmann, Eduard Lehrbuch der Speciellen Pathologischen Anatomie Berlin, 1901
- ¹⁵ Keyes, E L, and E L, Jr The Surgical Diseases of the Genito-Urinary Organs, 1903
- ¹⁶ Kurpjuweit, O Zur Diagnose von Knochenmarksmetastasen bei malignen Tumoren aus dem Blutbefunde From the clinic of Professor Lichtheim, Königsberg, Archiv für klinische Medizin, September, 1903, Band lxxii, Hefte 5 and 6
- ¹⁷ Labadie, G Du cancer de la prostate These de Lyon, 1905
- ¹⁸ Moynihan, B G A On Removal after Suprapubic Cystotomy of the Prostate and Prostatic Urethra for Senile Enlargement of the Prostate ANNALS OF SURGERY, January, 1904
- ¹⁹ Oraison, H Du cancer primitif et limité de la prostate et de son traitement par le prostatectomie perineale Annales des maladies des organes genitourinaires, May, 1903
- ²⁰ von Recklinghausen, F Die fibrose und deformirende Ostitis der Osteomalacie und die osteoplastischen Carcinome in ihren gegenseitigen Beziehungen Festschrift zu Virchow's 71 Geburtstag, Berlin, 1891
- ²¹ Richardson, Maurice H Neoplasms, wherever situated, should, if possible, be removed, whatever their Apparent Nature Report of the Southern Surgical and Gynæcological Association, The Journal of the American Medical Association, January 9, 1904
- ²² Sasse, F Ostitis carcinomatosa bei carcinom der Prostata Archiv für klinische Chirurgie, 1894, Band xlviii, S 596
- ²³ Thompson, Sir Henry Carcinomatous Deposits in the Prostate Gland Pathological Transactions, London, 1854
- ²⁴ Weber, F Parkes Multiple Myeloma (Myelomatosis) with Bence-Jones Protein in the Urine The American Journal of the Medical Sciences, October, 1903
- ²⁵ Wolff, Richard Ueber die bösartigen Geschwülste der Prostata insbesondere über die Carcinome derselben Deutsche Zeitschrift für Chirurgie, July, 1899, Band lvi, Hefte 3 and 4

REVIVAL OF SUPRAPUBIC PROSTATECTOMY

BY FRANK D. GRAY, M.D.,
OF JERSEY CITY,

Surgeon to City Hospital, Christ Hospital, and Consulting Surgeon to the North
Hudson Hospital

AMERICAN surgeons have, as is well known, to a great extent, allowed suprapubic prostatectomy to lapse into a state of "innocuous desuetude" owing to the unfortunate results of the old Belfield-McGill operation and the improvements recently made, mostly by Americans, in the perineal route.

Mr. Moynihan's interesting article, describing, in the *ANNALS OF SURGERY* for January of this year, his method of removing the hypertrophied prostate by the suprapubic route and reporting the twelve cases operated by him up to the date of writing, not only calls attention to the recent return of English surgeons to operations through the bladder, but suggests some matters of interest connected with what is generally known in England as the "Freyer Suprapubic Prostatectomy," of which the Moynihan technique is evidently a modification, in that he makes no attempt to preserve any portion of the prostatic urethra, while in other respects he follows the essentials of the operation as practised and published by Mr. Freyer¹ about a year earlier than by Mr. Moynihan.

Mr. Moynihan very justly gives Mr. Freyer credit for "calling us back to the rational surgical treatment of enlargement of the prostate." By this I take it he means as contrasted with castration and vasectomy, for the English surgeons have never taken very kindly to the perineal route.

I judge that a brief explanation of the principles on which Mr. Freyer bases his "enucleation" will interest many who are engaged in prostatic surgery, but who have come to regard the "upper route" as obsolete, ineffective, and dangerous, and who have either overlooked Mr. Freyer's writings or have not attached to them the importance they deserve.

My object is to touch upon general principles rather than technical details, which are aptly described by Mr Moynihan, as well as in the writings of Mr Freyer, already referred to, and in a recent monograph by the same operator²

Several personal interviews with Mr Freyer in April, 1903, together with an opportunity to examine the prostates removed by him, enabled me to form, at first hand, a very fair idea of his operation, its scope, underlying principles and results. Briefly stated, he holds that the operation of prostatectomy is rarely, if ever, indicated prior to the age of fifty-five. In common, also, with German genito-urinary surgeons, he thinks that cases under that age, and many subsequent to it, receive most benefit from other expedients,—especially properly conducted catheterization,—and that only when “catheter life” has reached its limits should the radical operation be invoked.

He contends that a certain class of hypertrophied prostates—notably the large adenomatous type, which he considers proportionately more numerous than do many—can be most easily and safely dealt with by the suprapubic route, with perfect restoration of bladder function and a very small mortality.

Finally, he argues that these results are best accomplished by the technique which bears his name,—but for which he expressly disavows originality,—except such as consists in a revival of the anatomical teachings of Sir Henry Thompson some thirty years ago.

Thompson taught that the prostate has a thin, closely adherent, fibrous covering, dipping between the lobes of the gland, and from which it cannot be enucleated, also that outside this capsule is another covering (which Freyer terms the sheath), in reality the layers of the rectovesical fascia, between which and the capsule is a natural “line of cleavage.” Freyer’s comparison of the prostate, capsule, and sheath to an orange, with its closely adherent inner skin which dips between the various sections and is surrounded by the rind, from which it is readily enucleated, most perfectly conveys the anatomical idea on which his suprapubic enucleation is based. He calls attention to the fact that in foetal life the prostate is double,—two

lateral halves,—and that later they are only united by the upper and lower borders, thus enclosing the urethra, while in the advanced adenomatous enlargement these connections, especially the upper, easily give way, facilitating their separation from the urethra. It is evident, from the loose application of the terms capsule and sheath by many American surgeons,—often using them synonymously,—that they have no clear conception of the Freyer-Thompson anatomical idea.

Freyer alludes, however, to the fact that prostates affected by fibroid hypertrophy (which he considers much less frequent than the adenomatous), and those in which inflammatory processes have existed, usually present a difficult “line of cleavage,” owing to fibrous bands and adhesions between capsule and sheath which render them unsuitable cases for his method. Moynihan hints at this fact when he says that “the larger the prostate” (adenoma) “the easier the stripping.” It is in the fibroid and inflammatory prostates that the perineal route, with the wide open door afforded by the inverted V or Y incisions, proves so useful, by permitting the necessary and often difficult dissection under direct observation.

A large element in Freyer’s success is his careful selection of cases, choosing for his special technique chiefly the adenomatous type of hypertrophy, usually quite large prostates, ranging from two to twelve ounces in weight, and fairly soft, with a feeling, on examination, of being somewhat movable, or, as he very aptly puts it, “as if they had more or less shaken themselves loose in their sheaths.”

Owing to careful selection and to the fact already mentioned, that he advises many patients against all operations for the time being, he operates, as he told me, on only about one in twelve of those applying.

Two cases of unfortunate selection came under my observation at St. Peter’s Hospital, London (where Mr. Freyer is an attending surgeon). Both operations were by the Freyer technique, although he himself regarded the cases as unsuitable because of their fibroid character. The surgeon in each case was competent, one a man of international reputation. Each

operation was difficult and tedious, the glands coming away piecemeal or much lacerated. Both patients died within a week on account of sepsis. The sheath had evidently, in each instance, been torn, allowing infiltration of urine. A similar case is reported by Moynihan who, in his table of twelve cases, remarks, "Gland removed in six places. Not an enucleation similar to the other. Probably the right layer for stripping the capsule away was missed," evidently a fibroid prostate. The result was fatal. These illustrate the essential difference between the method of Freyer and that practised by Belfield and McGill ten or fifteen years ago.

Applying the suprapubic method to all cases and failing to recognize the easy "line of cleavage," even in the suitable ones, the latter surgeons fell into one of two errors, either invading the gland, on one hand, and tearing out piecemeal the most prominent portions, resulting in an incomplete operation, or opening the sheath, on the other hand, allowing infiltration of urine and sepsis.

Freyer explains the remarkably small amount of hæmorrhage and the rapid obliteration of the cavity left after enucleation in most of his cases by the resilience of the sheath, or fascia, and the contractility of the surrounding muscle, a process which he compares to the rapid contraction of the parturient uterus after delivery of its contents.

The suprapubic enucleation, as done by Freyer (or as possibly improved on by Moynihan), avoids both the errors mentioned above, and when applied to proper cases restores deserved confidence in the "upper route." The only essential difference between the Moynihan and Freyer operations, of course, is their treatment of the urethra.

The former surgeon evidently believes it safe to bring away the entire prostatic portion with the gland, and, if correct, he has materially simplified the operation. The latter never removes the whole prostatic urethra unless by an unavoidable accident, and while I have seen prostates which he had successfully shelled from the urethra, leaving the latter intact, he admits that he often has been obliged to sacrifice the urethral

floor, with no unfortunate result. Still, he always endeavors to preserve the urethral roof. It would seem that time only can establish the superior wisdom of either course.

At present, it would appear that a section of urethra entirely surrounded by cicatricial tissue would be very liable to stricture, otherwise the possibility of ignoring the urethra in prostatic enucleation undoubtedly simplifies the operative technique, and, by the way, must apply to the perineal as well as to the suprapubic route.

To summarize then, "rational surgical treatment of enlargement of the prostate," according to as good an authority as Mr. Moynihan, for which the profession is clearly indebted to Mr. Freyer, is based on the recognition of a distinct capsule and sheath with an easy "line of cleavage" in a certain well defined class of cases, which permits a rapid and safe enucleation of the gland through a very small suprapubic incision, by means of the finger only, unaided by instruments, and avoids the former accidents of either digging into the prostate or penetrating the sheath.

In April, 1903, Mr. Freyer had removed in this manner, during a period of about two and one-half years, forty-six prostates, the patients ranging from fifty-five to nearly eighty years of age, with three deaths, only one of which could be directly attributed to the operation. In the surviving forty-three cases restoration of bladder function was prompt and complete. He often enucleates the prostate in four minutes, rarely taking more than eight minutes, practically, all patients were entirely well within a month.

It is quite evident that the essential principle of close adherence to the space between capsule and sheath is as important in operations by the perineal as by the suprapubic route.

It is also plain that by the Freyer enucleation we have a choice, in selected cases, of an operation preferable in many ways to the dissection through the perineum. If American and English surgeons recognized the availability of both the upper and lower routes, and chose the operation adaptable to the

special type of each case, I am satisfied that prostatic surgery in general would be placed on a materially higher plane

REFERENCES

¹British Medical Journal, Vol 11, 1901, page 125, and subsequent papers in same journal

Stricture of Urethra and Hypertrophy of the Prostate Freyer, second edition, Ballier, Tindall & Cox, London

INTRADURAL TUMOR OF THE CERVICAL MENINGES

WITH EARLY RESTORATION OF FUNCTION IN THE CORD AFTER REMOVAL OF
THE TUMOR

BY HARVEY CUSHING, M D ,

OF BALTIMORE,

Associate Professor of Surgery in the Johns Hopkins University

(From the Surgical Service of Dr Halsted)

THE following case adds one more to the recorded instances of operative removal of an intradural spinal tumor. From a critical stand-point, namely, that of complete extirpation of an enucleable growth, not only without augmentation of pre-existing pressure symptoms from operative trauma, but also with a subsequent and seemingly complete restitution of the normal physiological integrity of the cord, the number of these cases has been exceedingly limited. An interval of over ten years elapsed after Gowers and Holsley's brilliant demonstration of the feasibility of such surgical procedures before any correspondingly successful case was recorded, and this, in spite of the evidence, from statistical studies made in the interim, that a large proportion of the subdural tumors found at autopsy remain non-infiltrating and enucleable even in the advanced stage at which they have been more or less directly the occasion of death.

Earlier diagnosis, more exact methods of segmental localization and more frequent laminectomies for exploratory purposes in doubtful condition, now that the procedure has come to be regarded as one relatively free from danger, happily are combining to increase the number of these most gratifying operations. Within the past few years there have been reported four or five cases which serve to indicate what may be expected in the near future. One of them, most carefully described by

Henschen and Lennander, is in almost every detail, in symptomatology, segmental situation, pathological characteristics of the growth and operative result, the exact counterpart of that which it is my privilege here to record—a needless task, therefore, were it not for the comparative rarity of these cases and the desirability of accumulating evidence concerning them.

Due to the early and unequivocal diagnosis made after the patient's admission to Dr Osler's service,¹ and his prompt transference for operation without the customary period of temporizing with antiluetic treatment, the case seems in many respects the most satisfactory of any heretofore recorded. A few months more of compression doubtless would have left the cord in a condition from which functional restoration, though possible as other cases have demonstrated, nevertheless would have been much less rapid. Practically, normal function was regained by Gowers and Horsley's patient, though at the time of operation he had become completely paraplegic. Eskridge and Freeman's case was almost as far advanced—the symptoms in Henschen and Lennander's patient had progressed considerably beyond those present in our case. The rapidity of functional recovery in the compressed cord, as well as its completeness, has naturally been inversely proportionate to the extent and duration of the pressure exerted upon it. In some of the cases of successful removal of a meningeal tumor, a temporary increase in pressure symptoms has been occasioned by the operation, with a consequent retardation of the physiological recovery. A few have been reported before restoration was complete, though it promised to be largely so. In one or two instances there has been little, if any, postoperative diminution whatever in the pre-existing paralysis. The great desideratum in this, as in any surgical procedure, is not only

* *Note by Dr Osler*—"When the patient first consulted me I suspected cervical caries or pachymeningitis. It was not until after his admission to the hospital, and a more careful study of the case with Dr H. M. Thomas, that tumor was suspected. I urged early operation, feeling sure that the condition would not be made worse."

to alleviate suffering, but if possible to restore the patient's "Arbeitsfähigkeit," as it is expressed by the Germans

Surgical No 15,414 Intradural Fibrosarcoma of the Spinal Meninges opposite the Sixth, Seventh, and Eighth Cervical Segments Laminectomy with Enucleation of Growth and Closure of Wound without Drainage Uneventful Convalescence Rapid and Complete Recovery

The patient, L H, aged thirty years, the son of a Russian immigrant, entered Dr Osler's service October 14, 1903, complaining of "pain in his shoulder and of awkwardness in his gait"

Family History—His parents are living and well, also a brother and three sisters One sister died in childhood No family record of tuberculosis, tumor, rheumatism, or gout No other instance of paralysis in the family

Personal History—The patient had measles when ten years of age, and later some fever which kept him in bed a few weeks No knowledge of scarlet fever, malaria, pneumonia, typhoid, or influenza "Has always been healthy" He denies venereal infection and there is no history suggestive of lues He has been moderate in the use of tobacco and alcohol and regular in his habits For ten years he has worked as a clerk in a wholesale dry-goods house His usual weight is 132 pounds He has been married seven years and has two children living and well His wife, a delicate woman, has had three miscarriages, one at three and two at seven months She has never had any other illnesses to his knowledge

Present Illness—Eighteen months ago (July, 1902), when otherwise in good health, the patient began to have pain in the flexor surface of his left forearm It increased in severity during the succeeding months, extended into the region of the left shoulder and upper part of the back, and was often so severe that he was unable to sleep Movements of the neck aggravated his discomforts to such an extent that he had to be helped out of bed every morning On assuming the erect posture and moving about for a time, "limbering up," he could manage to go to work for the day After a few months the pain became less acute and he was much less incapacitated by it, although he had constantly to guard himself against making any sudden movement of his

neck Almost from the first he has noticed that sneezing, laughing heartily, yawning, or coughing would cause pain to shoot from his shoulder out into the arm, a symptom which has persisted to the present time

This condition of things continued without especial change during the remainder of the year Early in 1903, he does not remember exactly when, a burning sensation in the right and some weakness of the left leg was first noticed He kept at work at this time, although his movements were necessarily slow and deliberate, and there was some dragging of the left foot, with especial difficulty in mounting stairs There were no pains in the lower extremities On arising in the morning a sensation of "stiffness" and inability to use his legs would invariably be present, but would wear off after exertion For some time past he has observed a "wasting" (atrophic) condition in the muscles of the left hand, but has used it so little, owing to the pain in the arm, that he seems unaware of any especial weakness He has noticed also that alterations in surface temperature, when in a warm bath, for example, or when his feet are in contact with a cold floor, are less easily recognized on the right than the left side

In August, 1903, he was in bed for ten days with a high fever, supposed to be typhoid Since then his symptoms have become somewhat aggravated and he has not returned to work He has been very constipated of late, and there is some unaccustomed hesitancy in evacuating the contents of his bladder No disturbance of the sexual functions has been observed

Physical Examination—A well-nourished, sallow-complexioned young man Mucous membranes of good color, no jaundice The tongue is clean and protrudes in the mid-line No lead line on gums The teeth are clean and sound No glandular enlargement or other swelling on the neck No tracheal tug

The thorax is well formed and symmetrical Examination of the heart, respiratory and vascular systems is negative

The pulse is regular in force and rhythm and of good volume The blood-pressure in the brachial represents 123 millimetres of Hg

The abdomen, the genitalia, etc, present nothing noteworthy

Blood examination Hæmoglobin, 74 per cent, red blood-corpuscles, 4,232,000, white blood-corpuscles, 7400

A tendency to a subnormal temperature was more or less constant On two occasions, 96° F (mouth) was recorded

Special Examination—The left pupil is slightly smaller than the right Both react equally well to light, directly and consensually, and accommodate for distance There is no apparent difference in the width of the palpebral clefts, no vasomotor disturbances in the face There is no paralysis of any of the cranial nerves

The patient is quite round-shouldered, naturally so, but in addition carries his neck somewhat stiffly bent forward There is no thickening or especial prominence of the cervicodorsal spines, no particular tenderness, no muscle spasm, no great limitation of motion, hyperextension is possible to a considerable degree Passive flexion of the neck is, however, strongly resisted Active movements on the part of the patient seem more apt to cause pain than passive ones Pharyngeal palpation of the vertebral bodies is negative There is a slight convex curve, not exceeding normal limits, however, of the dorsal spines to the right side

The patient stands without great difficulty but with some unsteadiness, especially when the eyes are closed He cannot stand upon his heels, nor can he rhythmically tap the ball of either foot upon the floor He tires quickly, and after standing for a time there is a marked tremor in the muscles of the left leg He uses this leg very awkwardly in walking He has considerable difficulty in standing on either foot alone

The *subjective pains* radiate into the left arm and down as far as the wrist without definite localization, they also shoot into the posterior triangle of the neck They are paroxysmal and occasioned by any straining effort, sneezing, coughing, or by any sudden movement They are at present not particularly severe A burning sensation has been present in the right leg almost from the onset There are no areas of hyperæsthesia

Motor Disturbances—None are apparent on the right side of the body On the left there is a marked atrophy of the intrinsic muscles of the hand, with wasting of the thenar and hypothenar eminences, as well as of the intermetacarpal spaces The fingers of this hand can barely be separated and the grasp is very feeble Weakness of the extensors and flexors of the fingers and of the flexors of wrist is also marked, less so in the wrist extensors The flexors of the elbow with supinators and pronators of the

forearm and the triceps are also weak when compared with the sound side. The movements of the shoulder are performed with equal strength on the two sides, though the costal portion of the pectoral and latissimus dorsi contract less powerfully on the left than right.

Below the level of supply by the first thoracic segment the entire musculature of the left side of the body seems less strong than on the opposite side. All movements of the lower extremity, especially of the toes and dorsal flexion of the foot, are made only with considerable effort.

Comparative measurements in circumference of the arms

	Right	Left
Upper arm	25	22½
Forearm	25	23
Hand	21	20

The thigh and calf of the left leg are throughout nearly one centimetre smaller in circumference than the right.

Sensory Disturbances (See Charts, Figs 1 and 2)

On admission (October 14), examination showed no interference with the transmission of tactile (common sensation) impressions from either side of the body, nor was there an appreciable loss in tactual sensitivity at any subsequent examination. Thermic and pain perception was lost over the entire right side of the body from the level of the second intercostal space. No note was made of any involvement of the postaxial surface of the arm at that time. An examination three weeks later (November 4) showed the upper margin of thermo-anæsthesia and analgesia to have extended to the elbow along the inner surface of the upper arm, and on November 18 it was found to have extended to the forearm and hand according to the diagram (Figs 1 and 2). Posteriorly in the mid-line it reached as high as the spine of the first thoracic vertebra. Some lowering in the acuity of thermic and painful impressions was also to be made out on the left side below the level of the second intercostal space, though the area faded out, without definite boundary, about the level of the fourth rib. No stereognostic difficulty with either hand. No apparent loss of muscle sense in the extremities.

Reflexes, Deep—There is an exaggeration of the deep reflexes at knee and ankle on both sides, and a clonus may be easily elicited, especially on the left side. Exaggerated responses from

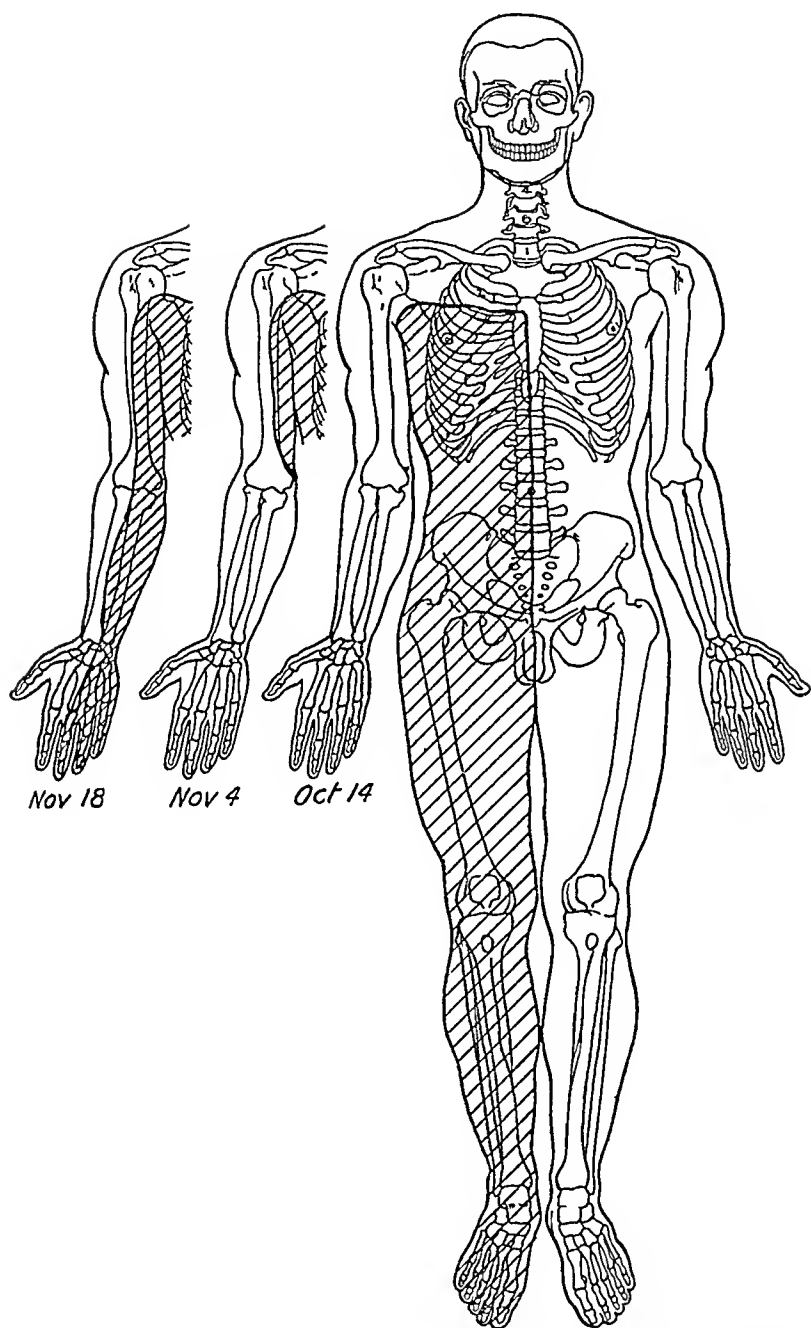


FIG 1—Chart of anesthesia, anterior view. Shaded area represents the field of anesthesia to pain and temperature on three successive dates. Some dulling of these sense qualities was present on the left, though with boundaries too indefinite to chart. No appreciable diminution of tactile perception anywhere present.

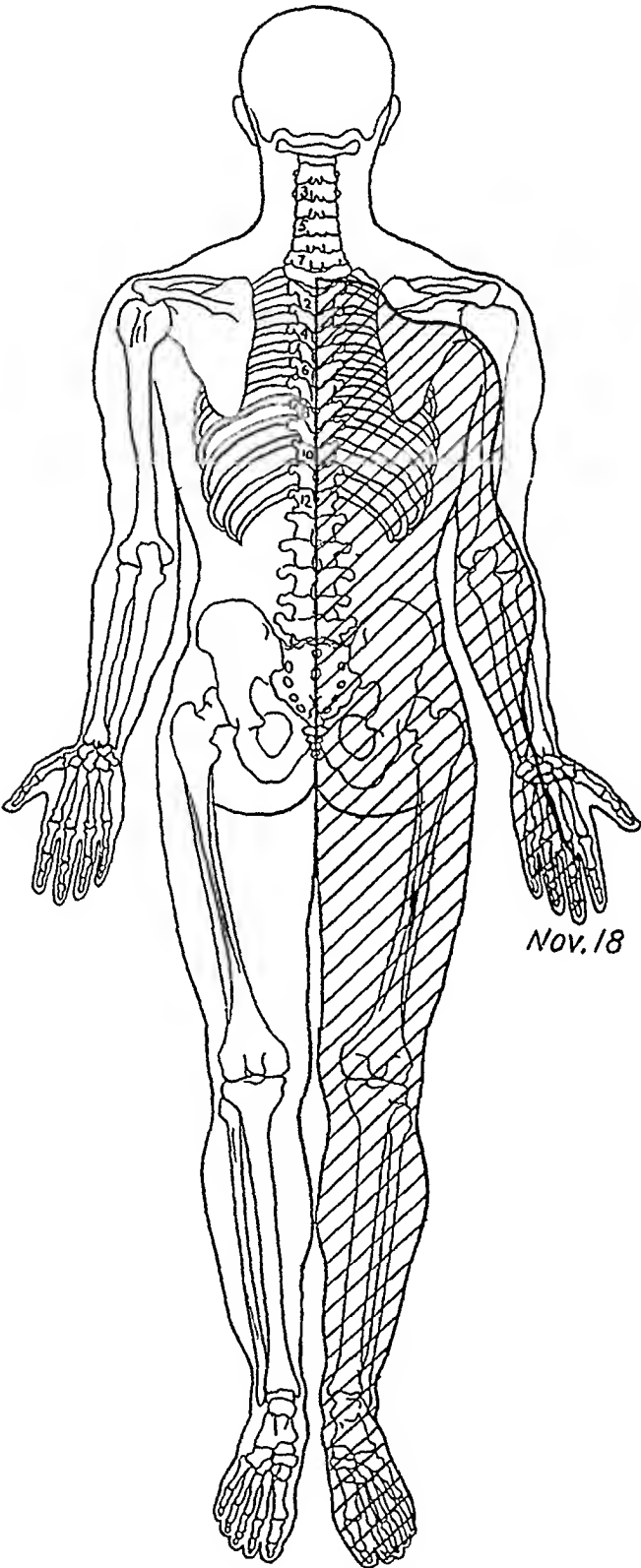


FIG 2 —Chart of anæsthesia, posterior view

tapping on the biceps tendon and flexor tendons of the wrist are also obtainable in the left arm

Superficial—Very active responses to plantar stimuli, often with drawing up of the legs, are present on both sides, apparently with a dorsal flexion of the great toe, though not especially characteristic of the Babinsky reflex. The cremasteric response, though sluggish, is obtainable on each side, least inactive on the right. No abdominal or anal (sphincter) reflex could be elicited.

On October 25 tuberculin was administered for diagnostic purposes, without any subsequent reaction.

On October 30 an X-ray plate was taken of the cervicodorsal region. It showed no abnormalities of the spinal vertebrae.

November 19, 1903 Operation Ether Anæsthesia—The patient was placed on the table, with the arms hanging at the side in order to separate the scapulæ, and with his neck anteflexed. An inflatable pad of Dr. Follis's design, which had been inserted under the neck and thorax, was then blown up so as to make the cervicodorsal spines the most elevated portion of the body.

The laminectomy was performed in the usual manner. A median longitudinal incision was made from the spine of the fourth cervical to the third thoracic vertebra (Fig 6) and carried down to the bony processes. Care was taken to split all the soft parts, especially the ligamentum nuchæ, in the mid-longitudinal line. The muscles were cut away from the spines and laminae of the exposed vertebrae on each side, and held aside by hot saline compresses and broad retractors. As much of the periosteum as possible was scraped off from the arches. The spines of the two lower cervical and the first thoracic vertebrae were cut away with heavy bone forceps. Some confusion in orientation was occasioned at first by the fact that the fifth cervical, instead of the sixth, was the last bifid spine, the vertebra prominens, however, was sufficiently characteristic to be a reliable landmark. The laminae were then carefully cut away from the three exposed arches.

On removing the fatty covering of the dura, the membrane, about six centimetres of the posterior aspect of which was exposed, was found to be abnormally tense and vascular, with an unusual dilatation of the median posterior vessels. This condition was for the moment thought to be due to the patient's position. It was not until the membrane was carefully opened and

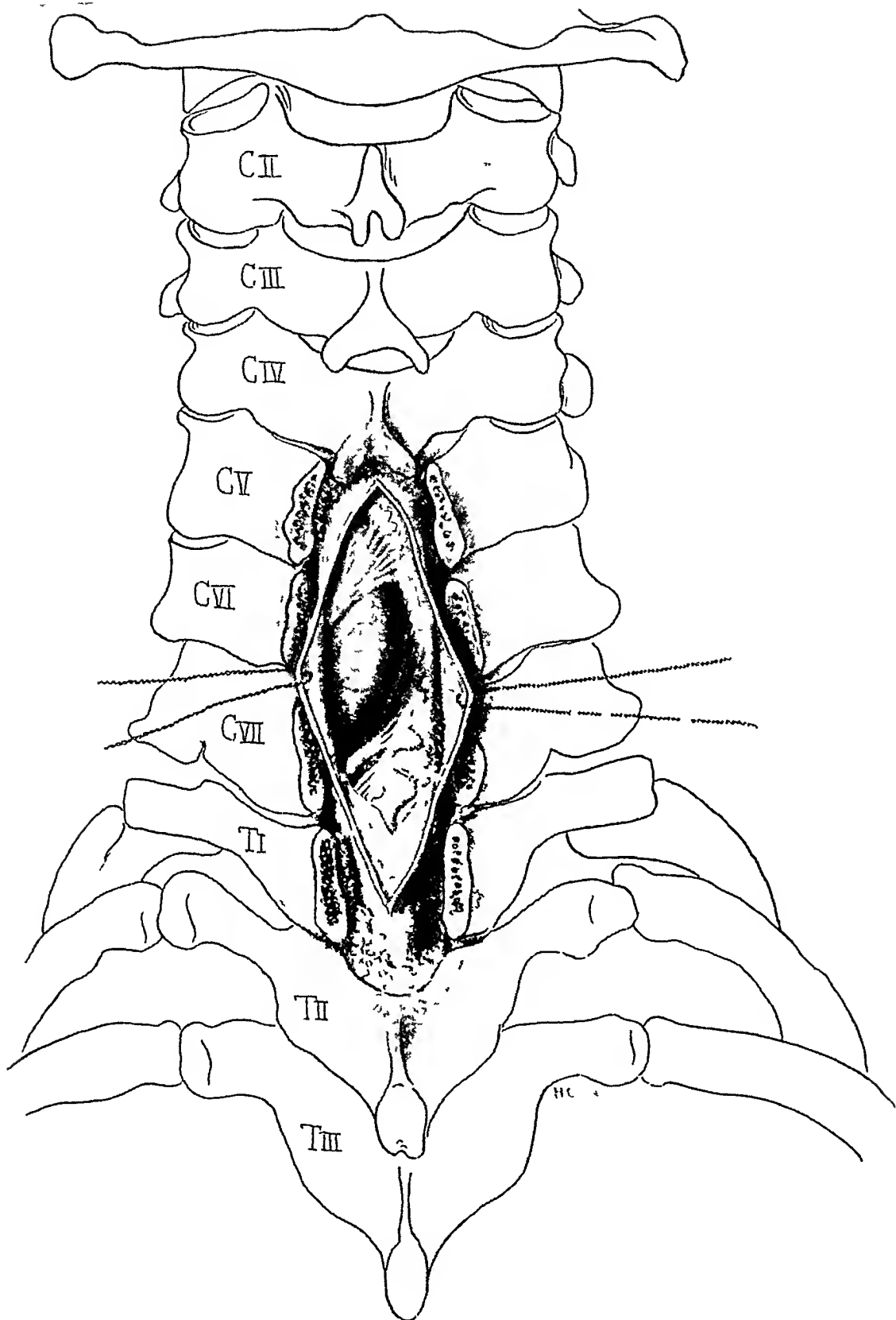


FIG 4 —Semischematic view from a sketch at the time of operation, of the position of the growth in relation to the inclosing vertebrae

the abnormal amount of fluid contents disclosed, that the true cause of the distention was apparent. Fluid escaped in considerable amount from the subdural space. The dura was then incised the full length allowed by the exposure, and on holding apart the edges of the membrane the thin, transparent arachnoid bulged into the opening like a distending bubble. This was pricked with a knife and the fluid spurted from the opening in jets corresponding with the cardiac and respiratory rhythm. Not until the contents of the subarachnoid space was thus evacuated and the transparent membrane had settled down closely over the cord was it apparent that there was some underlying abnormality. The thin arachnoid was then in its turn incised as far as the wound allowed, and lying on the left side of the cord, perhaps about four-fifths of it exposed, was seen to be an oval-shaped growth of a dusky purplish color. The cord itself was compressed to the right, was somewhat flattened, and much more vascular than usual in its appearance. The pial veins, especially the mid-longitudinal vein, was much congested and very tortuous. At this stage the tumor began to extrude itself into the wound, and by gentle manipulations its lower pole was readily freed and tilted upward. One posterior nerve-root lay across the upper portion of the exposed surface and served to retain the upper pole of the growth in its original position. Division of this root made it possible to liberate the tumor still more, and, although its superior end was hidden under the laminae of the fifth vertebra, it was thought probable that it could be shelled out without removal of this bony arch, which was somewhat difficult of access. Unfortunately, this proved to be impossible, for the tumor was found somewhat adherent laterally to the membranes, and in the process of separating them the soft tumor broke across, leaving its upper third still in position. At this juncture it seemed, after all, advisable, in order to insure a complete extirpation, to remove the laminae of the fifth vertebra. This was done, and the exposure sufficed to bring into view the upper pole of the growth, which was then removed as a separate piece. The accompanying sketch (Fig 4) serves to show the relative position of the tumor and the neighboring vertebrae.

The manipulation to remove the tumor occasioned from time to time some bleeding, chiefly of a venous character, which was readily controlled by pledgets of sterile absorbent cotton, these

were tucked into the spaces which the tumor had occupied, great care being taken not to traumatize the cord itself. The canal was then irrigated with warm salt solution to wash away the few clinging blood-clots.

The wound was closed in layers, delicate interrupted silk sutures for the dura, a layer of deep silver-wire mattress sutures for the spinal muscles, a second similar layer for the ligamentum nuchæ and aponeurosis of the trapezius, a subcuticular suture for the skin. No drainage was used for the wound. A dressing with a plaster-of-Paris support for the head and neck was applied.

The patient stood the operation remarkably well. No shock whatever was occasioned, nor was the small amount of blood lost sufficient to lower the arterial tension. The blood-pressure chart here reproduced (Fig. 3) shows that the only noteworthy alterations in systolic level were (1) a "pressor" response, which at the time was thought to be due to a slight asphyxiation from the patient's position which made anæsthetization somewhat awkward, and (2) a "depressor" response, which occurred at the time of evacuation of the pent-up fluid postaxial to the growth.*

Postoperative Notes—November 20. "The patient passed an excellent night, sleeping most of the time. He was given one-fourth grain of morphia in the afternoon on recovering from his anæsthetic. Otherwise no narcotics were demanded.

"This morning he is subjectively much more comfortable than before the operation. There are occasional shooting pains in the left arm and a sensation of numbness in the hand, but otherwise no discomfort. The pains are spontaneous, not increased by straining as before.

"His motor condition is much improved. Movements of the left side are perceptibly less weak. The patient is subjectively aware of this. A return of power is especially noticeable in the

* The comment has been usually made by those who have operated on these cases that the meninges below the tumor are greatly distended with cerebrospinal fluid (chiefly subarachnoid) under an increased tension, the tumor, as it were, acting as a cork to the spinal flask in which fluid continuously accumulates. A lumbar puncture with measurement of this tension may be of diagnostic value in these cases, and should be unattended by risk, if no more of the fluid be withdrawn than is necessary for the making of the observation.

FIG 3

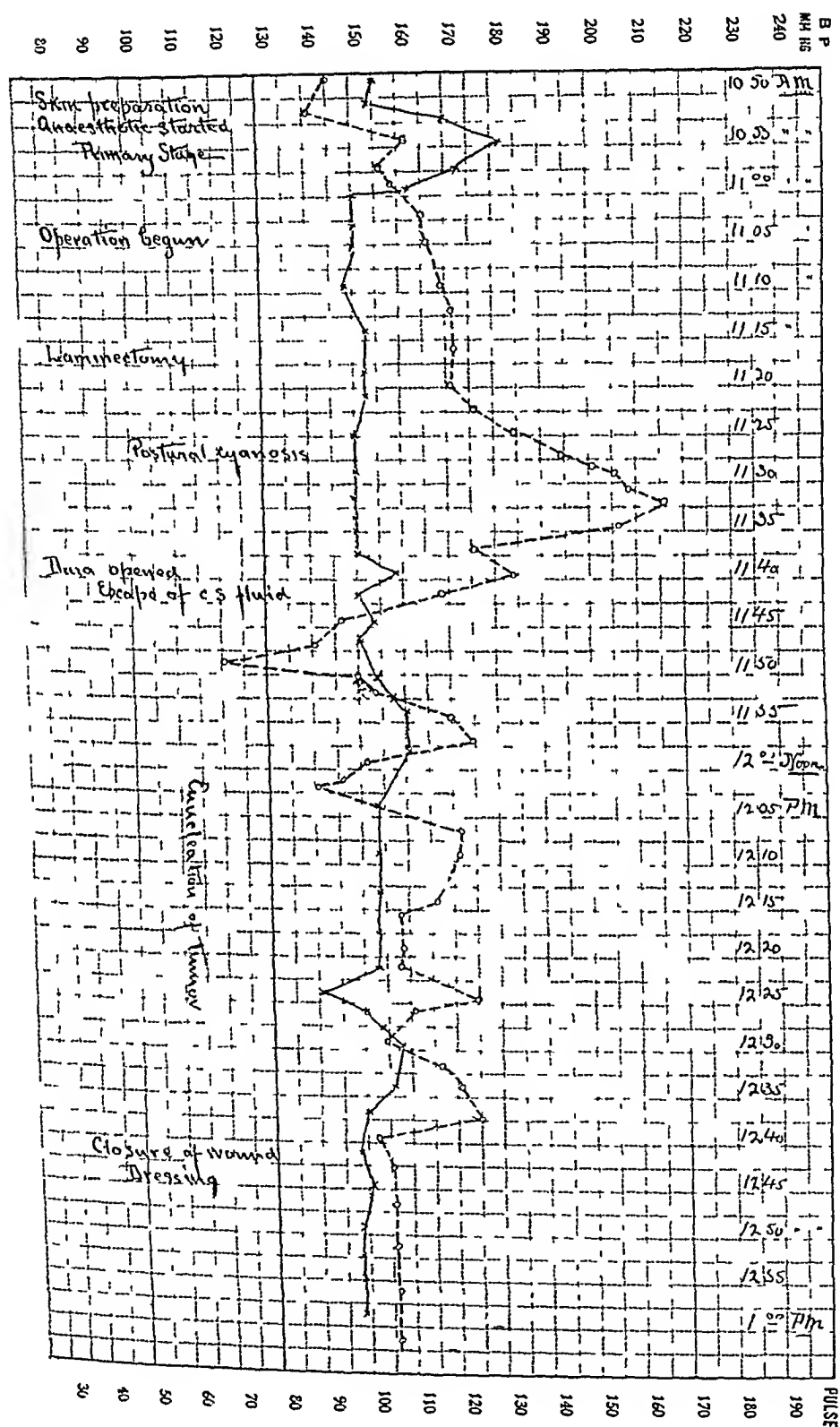


Chart of pulse rate and blood-pressure during the operation — Blood-pressure (Riva-Rocci), broken line, pulse-rate, solid line

Note (1) the comparative regularity of pulse-rate during the operation, (2) the "pressor" response during the laminectomy in spite of the associated loss of blood, (3) the "depressor" response accompanying the escape of cerebrospinal fluid, (4) the absence of evidence of "shock" during or after the procedure

dorsal flexion of the toes and foot Even the movements in the wasted hand are stronger He can now hold his fingers apart with some resistance "

" Considerable diminution is also apparent in the degree of anæsthesia Over the entire right side, as high as can be examined (the dressing covers the body to the xiphoid level), the patient distinguishes readily between the head and point of a pin Compared with the left side, however, there remains considerable hypalgesia The area of lowered perception to pain in the right arm has entirely disappeared

" Thermo-anæsthesia persists on the right side below the level of the dressing, but, as with pain, there is a return of normal thermic sensitivity in the right arm

" No sensory disturbance can be detected on the left side below the dressing No loss of tactual (common) sensitivity anywhere on the body

" The deep reflexes remain active as before the operation, with the exception that no ankle clonus can be obtained on the right side "

It is unnecessary to detail the results of the subsequent daily examinations, which were painstakingly made by Mr L S Morgan,¹ then clinical clerk, and corroborated by other observers The symptoms as outlined on this first day's examination will be followed one by one until their disappearance

Subjective Symptoms—Occasional shooting pains were complained of in the left shoulder, arm, and down into the wrist for several days, but with diminishing intensity, and by the tenth day they had disappeared entirely The " numbness " complained of in the left hand was found on the second day to be associated with some hyperæsthesia, the area not having any very definite boundary, the pins-and-needles sensations being perhaps more marked in the middle and index fingers than in the others (Fig 5) The sensation of burning in the right leg and the pains occa-

* In addition to Mr Morgan's records, I am much indebted for many of the details of this history to the notes made by Dr McCrae, Dr Hirschfelder, and Mr Edwards, the clinical clerk of this case during his residence in Dr Osler's wards, and also to Dr Geraghty and Mr Morgan who cared for him after his transfer to the surgical side

sioned by laughing, coughing, sneezing, etc., were never felt after the operation

Motor Symptoms—The considerable improvement noted the day after operation gave promise of the rapid return of motor function, tests for the foot and leg on the third day, November 22, failed to show any difference in strength on the two sides. On the ninth day, when unobserved, he got up out of bed and walked the length of the ward to the patients' bathroom and back. He was up in a wheel-chair on the tenth day, was allowed to walk about on the following, and an examination on December 7 (eighteen days) failed to disclose any difference in the motor activity of the two legs. No lameness or hesitation whatever was apparent in his gait, his movements were active, and there was no subjective sensation of disability whatever.

The left arm and hand, although they regained their normal strength somewhat less rapidly than the leg, continued to improve without interruption. The strength on the two sides was about equal at the time of the patient's discharge, the measurement of the arm showed that it was filling out and the atrophied muscles were visibly increasing in size.

Sensory Symptoms—As recorded, the anæsthesia to thermic and painful stimuli in the right arm had entirely disappeared by the day after operation. On the right side of the body and leg the analgesia in twenty-four hours had so diminished that painful impressions, though dulled, were everywhere appreciated as such, and the difference between the head and point of a pin was recognized promptly. By the eighteenth day no difference in the acuity of pain perception was recognizable between the two sides, except for one patch on the inner aspect of the leg below the knee where pain seemed to the patient to remain somewhat dulled.

On the third day, for the first time, was the patient able to distinguish on the right side between heat and cold (though the sensation was not "natural") over the body and leg as low as the knee. By the eighth day (November 27) only the foot remained anæsthetic to thermic impressions. By the seventeenth day the slightest differences in temperature were appreciable everywhere over the right leg, with little if any disparity between the two sides of the body.

Postoperative Sensory Disturbances in Left Arm consequent upon Root Division—The only increment in symptoms of any

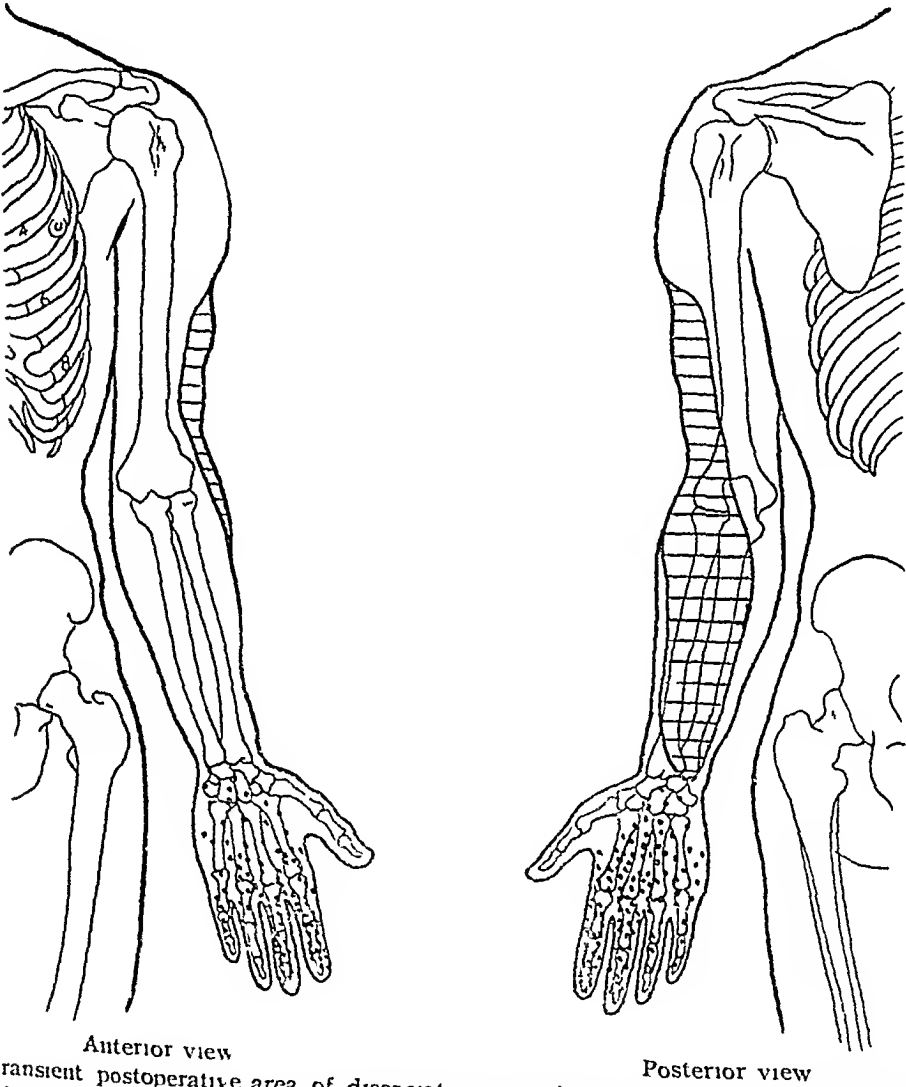
sort, which could be directly attributed to the operative procedure itself, occurred in the left arm, where there had been no pre-existing sensory disturbances other than those entirely of a subjective nature, the radiating pains. It will be remembered that one of the sensory roots overlay the growth and was intentionally resected during the operation. The physiological consequences of this step were largely in accord with Sherrington's recent observations on the dissociation of anæsthesia in the territory of an individual root after its division. There was noticed for the first time, at the examination made forty-eight hours after the operation, an area of partial analgesia and thermo-anæsthesia (Fig. 5) on the posterior and outer side of the upper arm reaching about to the level of the deltoid insertion, its anterior edge corresponding with the outer bicipital groove. The area extended down the back of the forearm to the wrist, including the external condyle, leaving the olecranon free, and with its lateral boundaries about in correspondence with the most superficial edges of radius and ulna when the forearm was semipronated. At this early period the outlines of the area were fairly distinct and remained so for some days, fading gradually until the tenth day, when the normal sensitivity to pain and thermic impressions had returned. At no time was there any appreciable dulling of tactile sense over this field. Sherrington's more recent experiments have shown that the overlapping between the cutaneous fields of adjoining segments is greater for the nerves conveying tactile sense than for those of pain and temperature. Thus, severance of a single root "renders certain patches of skin analgetic, though not tactually anæsthetic." It was noted in the experimental work that under these conditions the skin field thus delimited by analgesia and thermo-anæsthesia was smaller than the total skin field of root distribution as outlined by the method of "remaining æsthesia." The findings in this patient bear out in the case of man the experimental observations made upon apes. The particular root which was sacrificed was believed at the time, though it is impossible to state this positively, to be the seventh cervical, and the position of the resultant anæsthetic fields would be included within the sensory field presided over by this root in the

* Sherrington. The Spinal Roots and Dissociative Anæsthesia in the Monkey. The Journal of Physiology, 1901, Vol. XXV, p. 360

Macacuge as indicated by Sherrington and in a certain degree with Head's CVII area. It would possibly be included in Kocher's CV and in Wichmann's CV and VI territories.

In addition to this field of dissociative anæsthesia, sensory disturbances of a hyperæsthetic character, but without any dull-

FIG 5



Anterior view
Transient postoperative area of dissociative anæsthesia in left arm due to posterior root division. Dotted area of hyperæsthesia, shaded area of diminished perception of pain and thermic stimuli.

ing of sense perception, were present in the hand. To this the patient had called attention immediately after the operation as an unpleasant "numbness and tingling,"—a "pins-and-needles" sensation,—which was much increased by touching the part. It was most marked in the index and middle fingers, did not include the thumb, and shaded off as indicated in Fig 5. Evidences

of vasomotor disturbance were present at the same time, the hand being much warmer than the other and constantly moist. This condition of hyperæsthesia persisted for several weeks, much longer than the disturbances in the anæsthetic area, its final disappearance taking place about the third month with a gradual subsidence. It persisted longest in the index finger. The area involved was taken to represent the field of the adjoining post-axial nerve-root, or possibly to represent the zone of overlap with this neighboring field. It is a common observation to find, after a peripheral neurectomy in man, a hypersensitive strip delineating the anæsthetic field, and experimental investigations have demonstrated the presence of such hyperæsthetic boundaries for the anæsthetic field after the division of the dorsal nerve-roots.

Reflexes—The deep reflexes at the knee and ankle rapidly diminished in activity, especially upon the right side, where ankle clonus, easily elicited before, could not be brought out after the operation.

The unduly active response to plantar stimuli soon disappeared, and was replaced by an inactive state, in which no movements whatever in the toes or ankles could be brought out by stroking the sole. Normal cremasteric, anal, and abdominal reflexes equal on the two sides was obtainable by the third week.

At the examination three months after the operation the only residual of the patient's former symptoms lay in the slightly increased activity of the deep reflexes. It was unassociated with any spasticity, however. He could stand easily on the toes or heels, and while balancing on either foot could rapidly tap the toes of the opposite one on the floor.

Healing of Wound—The plaster dressing was removed for the first time on the ninth day (November 28), when the silver subcuticular suture was removed and a collodion strip applied without other support. The healing was absolutely without visible reaction. The photograph (Fig. 6) was taken on the fourteenth day, the patient being up and dressed at that time. He was discharged on December 16, four weeks after the operation, to all appearances perfectly well. The only evidence of any pre-existing trouble being in the slight wasting of the muscles of the left hand, which had, however, increased greatly in strength, in the active deep reflexes, and in the slight hyperæsthesia remaining in the index and middle fingers of the left hand.



Fig. 6—Photograph fourteen days after the operation. The wound, which is barely perceptible, requires no dressing. Crosses show its extent.

Late Result—The patient returned for an examination two months later, February, 1904. He was subjectively perfectly well and with no pains. No disability whatever was apparent from removal of the arches. He had gained eighteen pounds in weight, was back at work, "felt as strong as ever before." There was no difference in the appearance of the two hands, and the muscles seemed equally developed and supple. The hyperæsthesia of the fingers had gradually disappeared soon after leaving the hospital. Measurements of the arms showed only one centimetre in circumference throughout in favor of the right side. The only residual of his previous condition was in the slightly too great activity of the deep reflexes.

Pathological Report—November 19. The tissue consists of an oval-shaped tumor broken in two portions, its upper pole, consisting of about one-third of the growth, being separate from the rest. In its original state it measured in the long axis about four centimetres. The growth has a smooth outline and a delicate capsule. It is soft, quite vascular, and the surface on section is moist and of a grayish-pink color.

Microscopical Examination—The tumor is made up largely of connective-tissue elements, the cells being somewhat more numerous than seen in simple fibrous tissue. The growth is quite vascular, and there is considerable hyaline degeneration, chiefly distributed about the blood-vessels. It is impossible to say positively whether the growth should be classified as a fibroma or a sarcoma, a question which hinges entirely on malignancy, and which cannot consequently be determined by histological studies alone. Fibrosarcoma with hyaline degeneration.

There follows a bibliographical summary of the cases of intradural tumor which, from the double criterion of enucleability and of a more or less complete postoperative restoration of function in the compressed cord, have up to this time been successfully operated upon. They are arranged chronologically according to the dates of operation.

(1) GOWERS AND HORSLEY (Royal Medical and Chirurgical Society January 24, 1888, also "Ein Fall von Rückenmarksgeschwulst mit Heilung durch Extirpation" Uebersetzt u. s. w. von Dr. Bernhard Brandis. Aug. Hirschwald, Berlin, 1899.)

An intradural fibromyoma of the upper thoracic region (3-4) was removed by Horsley, June 9, 1887, from a patient, male, aged forty-two years, who after three years of symptoms had become completely paraplegic, presenting all the indications of a total transverse lesion of the cord

Ten days after the operation sensation began to return in the lower extremities and slight voluntary movements in two weeks. A slow but uninterrupted improvement followed, and a year later, June 6, 1888, he was practically well, though with some residual disturbances

(2) *ESKRIDGE AND FREEMAN ("Intradural Spinal Tumor opposite the Body of the Fourth Dorsal Vertebra, Complete Paralysis of the Parts below the Lesion, Operation, Recovery, with Ability to Walk without Assistance within Three Months" *Philadelphia Medical Journal*, December 10, 1898, Vol 11, p 1236)

On September 24, 1897, Freeman enucleated from the mid-thoracic region of a boy, aged twelve years, an intradural growth, designated as a "soft fibroma." This had given symptoms for a year, and had ultimately produced a marked degree of paralysis of both lower extremities. There was a rapid return of function in this case, improvement having been apparent almost immediately after the operation. Ultimate functional recovery of the cord (after some few months) was practically complete.

(3) FR. SCHULTZE ("Über Diagnose und erfolgreiche Behandlung von Geschwulsten der Rückenmarkshäute" *Deutsche Zeitschrift für Nervenheilkunde*, 1900, Band, xvi, p 114)

Schede, February 6, 1899, removed from the lower thoracic cord (opposite the seventh vertebra) a subdural fibromyoma. The patient, a young man aged twenty-eight, had had root pains for three years and almost complete spastic paralysis for six months. After a temporary postoperative increase in the degree of the palsy he began slowly to improve, could walk without support in six months, and in 1902 (reported in *Mittheilungen a d Grenz d Med u Chir* 1903, Band 21, p 156, Dritter Fall), when last examined, he was "vollkommen arbeitsfähig."

(4) PUTNAM AND WARREN ("The Surgical Treatment of Tumors within the Spinal Canal" *American Journal of the Medical Sciences*, October, 1899, Vol cxi, p 377)

An intradural growth was removed by Dr. Warren, some months before the report (no date given), from the lower dorsal region of a woman fifty-two years of age. Symptoms had been present something over a year. The complete enucleation of the tumor in the case was

* A case, the original report of which I have been unable to find in the literature, has been handed down through several articles (Chipault, Bruns, Starr, Putnam, and Warren et al.) as appearing in the *New York Medical Record*, 1890, Vol 11, p 564. Roy is quoted as having removed from the lower dorsal region of a paraplegic patient an intradural tumor with operative recovery and ultimate ability "to walk with a cane." This case possibly should be included in the above series.

followed by a temporary postoperative increase in the pressure symptoms, and, though there was a slow subsequent improvement in her condition which promised ultimate betterment, restoration of function was incomplete at the time of the report

(5) HENSCHEN AND LENNANDER ("Rückenmarkstumor, mit Erfolg extirpiert" *Mittheilungen a d Grenz d Med u Chn*, 1902, Band x, p 673)

An intradural fibrosarcoma compressing the lower cervical cord was removed by Lennander, February 8, 1900, from a man, aged fifty, in whom root symptoms had first appeared two years before. Pressure symptoms had been present for about a year and had advanced considerably beyond the Brown-Sequard type, and the patient was bedridden. Improvement in the cord symptoms began immediately after the operation, and by October 23 (eight months) the recovery was practically complete.

(6) FR SCHULTZE "Zur Diagnostik und operativen Behandlung der Rückenmarkshautgeschwulste" *Mittheilungen a d Grenzgebieten d Med u Chn*, 1903, Band xii, p 158 (Fünfter Fall)

Schede enucleated, December 12, 1900, at the mid-thoracic level a subdural "spindle-celled sarcoma." The patient, a young man, aged twenty-four, had had root pains for eight months and symptoms of pressure on the cord for four months. The convalescence, unfortunately, was complicated by an acute infective meningitis. After a year or more (1902) there was practically complete restitution of function, aside from some overactivity of the deep reflexes and the fact that he was easily fatigued.

(7) FEDOR KRAUSE ("Zur Segmentdiagnose der Rückenmarksgehwulste, nebst einem neuen durch Operation geheilten Fall" *Berliner klinische Wochenschrift*, 1901, Band xxxviii, pp 541, 583, 604)

A small intradural but adherent psammoma of the lower dorsal region was removed, June 18, 1900, from a woman aged sixty-five. A year later some slight improvement in motor and sensory symptoms had taken place.

Boettinger made a second report of this case (*Archiv f Psychiatrie*, 1901, Band xxxv, p 83) which seemingly has led to its being doubly entered in some of the collected lists of tumors of the cord. Compare Collins's recent exhaustive tabulation.

(8) OPPENHEIM ("Ueber einen Operativ behandelten Fall von Rückenmarkstumor" *Berliner klinische Wochenschrift*, 1902, p 905)

An intradural fibroma, compressing the lower thoracic cord, was removed by Sonnenberg, April 21, 1902.

The patient was a young woman of eighteen years, in whom symptoms had been present for only six to eight months, but had led to an early condition of spastic paresis with sensory disturbances in both lower extremities. A month after the operation, the first attempt was made to walk, and a month later she had so far improved as to walk faultlessly, and only the slightest evidence of the original pressure symptoms remained.

(9) PUTNAM, KRAUSS, AND PARK ("Sarcoma of the Third Cervical Segment, Operation, Removal, Continued Improvement" *American Journal of the Medical Sciences*, January, 1903, Vol cxxv, p 1)

An intradural "sarcoma of the round-celled type" was removed from the upper cervical region by Park, April 28, 1902. The patient, male, aged forty-five years, had had symptoms for two years, and was bedridden from a nearly complete paraplegia. When reported, six months later, considerable improvement in the pressure symptoms had already taken place, though a residual palsy of the crossed (Brown-Sequard) type still persisted.*

(10) PRESENT CASE—An intradural fibrosarcoma compressing the lower cervical cord was removed by the writer, November 19, 1903, from a man, aged thirty, in whom root symptoms had first appeared eighteen months before. Evidences of compression of the cord had been present for about six months, and had not quite advanced to the Brown-Sequard type of hemiparesis, the patient was able to move about with a dragging foot. Improvement in the cord symptoms began immediately after the operation, and by February 20, 1904 (three months) or earlier, there was no trace of the palsy observable, and the patient had returned to his former occupation.

This case and Case 5 are almost the exact counterpart of one another, differing only in the circumstance that Lennander's had progressed six months longer. The development of symptoms as far as they went was equally rapid in the two cases, and the growth presumably enlarged at a corresponding rate in both.

There have been several instances other than those mentioned above in which an intradural growth has been accurately diagnosed, localized, exposed at operation and removed, unfortunately, however, with a lethal result. There have been also cases in which an enucleable growth, which the operation failed to expose, has been demonstrated at autopsy, others as well in which a growth has been encountered and enucleated.

* This case is especially noteworthy as being the highest placed growth to have been successfully enucleated. Other higher ones have been attacked and partially removed with betterment of symptoms. The writer has personally had one case of meningeal sarcoma (pial?) originating from the bulbar meninges and projecting into the posterior fossa of the skull under the cerebellum. The occipital base, including the posterior half of the foramen magnum, was removed in this patient and the largest part of the growth enucleated. It so surrounded the bulb, although unattached and non-infiltrating, that the operation was abandoned. The child is much improved, and, though ataxic, seems to be temporarily "well" at the present time, six months later.

without subsequent restoration of function in the cord, whether from operative injury or from prolonged compression effects that have led to an irrecoverable condition of softening. These cases have not been included in the above list, nor have the more numerous instances of extradural growths that have oftentimes been operated upon with a greater or less measure of success. With few exceptions, notably one of Schede's cases in which an extradural fibroma was enucleated, the latter are infiltrating tumors which by extension into the spinal canal have ultimately led to pressure symptoms*. The intradural tumors primarily of pachymeningeal origin form a group quite apart. They are enucleable growths, and, were it not for their chance situation, with the severe pain they occasion and the ultimate paraplegia, would be regarded as comparatively benign conditions.

* One such case from Dr Osler's ward has recently been operated upon. An extradural metastatic(?) lymphosarcoma was removed from the mid-dorsal region of a negro after a few weeks of total paraplegia. There has been a steady improvement in symptoms and a promise of complete return of spinal function, though the ultimate prognosis necessarily is most unfavorable.

SARCOMA OF THE TONGUE

REPORT OF A RECENT CASE, WITH ANALYSIS OF PREVIOUSLY RECORDED CASES

BY CAMPBELL BROWN KEENAN, M D ,

OF MONTREAL,

Assistant Surgeon, Royal Victoria Hospital

SARCOMA of the tongue is sufficiently rare—there are, I find only some three dozen cases on record—to make a report of an individual case justifiable, more particularly when that case presents one or two characters varying slightly from already recorded cases. I propose, therefore, to describe our own case first in some little detail, analyzing afterwards the literature upon the subject.

The patient, a man aged forty-seven years, was admitted to the Royal Victoria Hospital upon December 17, 1902, complaining of a tumor far back upon the dorsum of the tongue. He gave the history that he first noticed slight pain about the beginning of September, and that it was accompanied by a sensation as though something was stuck in the back of the throat. Only a month later did he consult a physician, who noted a mass about the size of a pea at the back of the tongue. This mass had gradually increased in size up to the time of his admission to hospital, but with this the pain had decreased, nor had there at any time been difficulty in swallowing.

Examination upon admission showed a firm, globular tumor about 1.5 centimetres in diameter situated on the right side of the dorsum of the tongue between the pillars of the fauces. It had a broad base, was sunken somewhat into the tissues of the tongue, though at the same time the outer portion rose well above the level of the surrounding parts as a rounded mass. The covering epithelium was intact and the growth extended slightly into the pharyngeal wall, but did not limit the protrusion of the tongue. There were no enlarged glands in the neighborhood, nor was anything else abnormal to be made out in the general condition of the patient.

For diagnosis the upper portion of the tumor was sliced off and removed for microscopical examination. This was hardened carefully in Zenker's fluid. Sections stained in hæmatoxylin and eosin showed that the removed portion consisted almost wholly of a cellular growth covered by a healthy epithelium. The nuclei of the cells forming this growth appeared irregularly rounded and distinctly larger than that of lymphocytes. In these first sections the cell-bodies were not sharply differentiated. The tumor appeared to consist of a mass of relatively large, rather pale-staining nuclei, embedded rather closely in a semi-translucent matrix of cytoplasm. Mitotic figures and the results of recent mitosis were to be seen frequently. No transition of these cells into forms resembling fibroblasts could be made out. Here and there a few strands of adult fibrous tissue could be recognized, in general, the vessels, which, towards the periphery, were abundant, had walls consisting of a single layer of endothelium, and these in some areas gave an obscurely alveolar appearance to the growth. This appearance was very obscure, and when present could be seen to be associated with the delicate vascular net-work, and the more the sections were studied the more they were seen to exhibit the characters of a pure sarcoma. Here and there rather diffuse collections of cells, more of the appearance of lymphocytes, could be seen.

A second portion of the growth, removed a few days later, showed more successfully the nature of the growth. In this second set of sections the individual cells were clearly defined. In general, the individual cells were found to have a relatively considerable amount of cytoplasm and to possess one nucleus, though, not infrequently, two nuclei could be seen in the one cell. The nucleus was sometimes eccentric. Now sections stained by Malloiy's stain showed the arrangement of connective tissue and reticulum which is characteristic of a simple sarcoma. Broader bands of connective tissue, mostly perivascular, gave off a fine reticulum passing between the individual cells. Study of the regions where the smaller cells were accumulated led certainly to the impression that these were not simple infiltrations of leucocytes of inflammatory nature, but bore a definite relationship to the rest of the growth. As already stated, these small cells suggested lymphocytes, their nuclei were rounded and deeply staining, as compared with the more irregular, larger and more pale-

staining nuclei of the main mass of the growth. But intermingled with them, more especially towards the periphery of the masses, were what we may term cells of an intermediate order, with somewhat larger and often rather polygonal nuclei, not so deeply staining. Lastly, there were no indications of endarteritis nor of active proliferation of the connective tissue. The diagnosis was made of small round-celled sarcoma. Possibly, it would have been more correct to have spoken of this simply as a round-celled sarcoma, for the individual cells of the main mass of the growth were certainly larger than lymphocytes. I have usually classified round-celled sarcomata into the large and the small round-celled forms, and this appears to me to belong rather to the latter group than to the former. If my opinion be correct, that these larger cells have been derived from the small, deeply staining cells still present, then it would be correct to say that the growth originated as a small round-celled sarcoma.

At this period the patient was unwilling to have the operation for complete extirpation of the growth which was then recommended, and soon afterwards he entered another hospital. Unfortunately, the report of his case while there has been mislaid, so that only a very brief and probably faulty history of events can be given. So much of the tumor had been removed for examination that, with this and with possible sloughing out of the remainder, little of the tumor proper remained, or what was left became so infiltrated with inflammatory leucocytes that now the diagnosis became most doubtful. A local excision of the remaining mass was performed in January, 1903, and we learned that a section of the removed material had nothing in it to justify the diagnosis of sarcoma as distinguished from inflammatory tissue.

But about this same time the patient began to suffer from abdominal pain, and, on palpation, a mass was recognized in the epigastrium. Some weeks later an exploratory laparotomy showed the existence of an extensive growth in the region of the stomach affecting the peritoneum, portions of which, removed for diagnosis, were found to be sarcomatous. No attempt could be made to remove the growth, and, after the operation, the history was that of progressive failure of nutrition, terminating in death in August, 1903. The surgeon who attended him states that there was no sign of recurrence of the growth in the tongue. Death therefore occurred eleven months after the first onset of symptoms.

With great difficulty permission was obtained to perform a partial autopsy, examination of the abdomen alone was allowed, and permission could not be obtained either to remove or even examine the tongue. This partial autopsy was performed twelve hours after death.

Upon opening the abdomen numerous adhesions were found in the upper half, the omentum was short and thickened, a large mass lay on the posterior abdominal wall joining together the stomach, duodenum, and pancreas. These organs with the growth were removed *en masse*. And now upon naked-eye examination the growth was found to be soft, whitish in color, having in places a bluish appearance and extending through the stomach wall. This was extensively involved, and upon opening the organ a large ulcerated area was found situated about the middle of the greater curvature.

Sections of this growth showed that it was of the same nature as the original tumor in the tongue, being composed of cells of medium size with relatively large, roughly rounded nuclei, rather pale-staining, and surrounded by a fair amount of cytoplasm. These were extensively infiltrating the tissue of the part, the pre-existing fibrous stroma showing marked hyaline degeneration. Evidently, as a result of the ulceration, the tumor mass showed areas of necrosis and other areas in which there was considerable fragmentation of the nuclei, while here and there were small deposits of brownish pigment.

Obviously here was a metastasis from the original tumor, though, from the extensive nature of the growth, it is impossible to say with precision where this arose. The history renders it unlikely that the reverse was the case, and that the primary growth was abdominal.

Cases, it is true, are on record in which cancer of the tongue or œsophagus has been followed by secondary growths in the stomach, and the extensive ulceration of this latter organ in this case possibly favors to some extent the view that the metastasis began in the stomach wall. It is, however, possible that it originated in the lymph-glands behind the stomach. The point it seems to us, must be left open, with a decision slightly in favor of gastric metastasis.

SYNOPSIS OF PUBLISHED CASES OF SARCOMA OF THE TONGUE
INTERSTITIAL FORM

No	Reported by	Age and Sex	Clinical Condition	Histological Findings	Treatment and Result
I	Santessen Virchow-Hirsch Jahresb, 1887, 280		A tumor of left half of tongue, gradual growth for three years, covering of mucous membranes intact, parotid metastases	Small round cells with hyaline change in stroma	Not treated
II	Buthn Lancet, March 26, 1887, 623	Male, 40	Pain and tumor in left middle of tongue for two years	Lympho- or small round-celled sarcoma	Local excision, cured, no recurrences
III	Targette Guy's Hospital Reports, 1890, 21	Male, 65	A tumor in left middle of tongue for one year, causing slight pain and limitation of movement, mucous membranes intact	Small round-celled sarcoma	Local removal with recurrence <i>in situ</i> Death
IV	Max Sheir Berlin klin Woch, 1892, 534	Male, 28	A tumor at base of tongue for about one year, causing pain and difficulty in swallowing	Small round-celled sarcoma with infiltrating lymphocytes	Local removal with recurrence <i>in situ</i> Death
V	Denham American Journal of Medical Sciences, 1895, 259	Male, 61	Tumor of right side of tongue for eight months, mucous membrane covering intact	Large round cells with reticulum	Tongue with tumor removed, no recurrence
VI	Hutchinson Medico-Chirurgical Transactions, vol xlviii, 311	Male, 22	A slowly growing tumor at left base of tongue for twelve years, no symptoms, mucous membranes intact	Small round-celled sarcoma	Total excision of tongue, recurred in floor of mouth two and a half years later Death
VII	Berezgazy Krankheiten der Zunge, 1887, 226	Male, 42	Tumor of posterior portion of tongue for two years, causing pain and difficulty in swallowing	Small round-celled sarcoma	Not removed Death Metastases in peritoneum
VIII	Littlewood British Medical Journal, February 19, 1898, 492	Male, 17	A large tumor of middle of tongue	Round-celled sarcoma	Tongue and submaxillary glands removed, recurred in tonsil Death
IX	Downie British Medical Journal, October 21, 1899, 1065	Male, 23		Small round celled sarcoma	Tongue removed

PEDUNCULATED FORM

SARCOMA OF THE TONGUE

961

No	Reported by	Age and Sex	Clinical Condition	Histological Findings	Treatment and Result
I	Mikulicz u. Michelson Atlas der Krankheiten der Mund u. Rachenhole, Heft 2	Female, 24	A flattened pedunculated tumor on back of tongue for three months	Not given	Local removal
II	Ibid	Male, 57	A tumor of anterior third of tongue present for six months, mucous membranes intact	Fusiform-celled sarcoma	Amputation of part affected, recurred <i>in situ</i>
III	Mercier Rev Méd de la Suisse Romande, 1890	Male, 26	A slowly growing tumor of anterior portion of tongue present for eight years, mucous membranes intact	Large mixed-cell sarcoma	Removed locally, no recurrence
IV	Targette Guy's Hospital Reports, 1867	Male, 2	A tumor of dorsum of tongue present for seven weeks	Round to fusiform cells	Removed, local recurrence Death
V	Berger Rev de Chirurgie, 1897, 677	Male, 26	A pedunculated tumor of left side of tongue present for six months, causing pain and difficulty in swallowing	Fusiform-celled sarcoma	Local excision, recurrence <i>in situ</i> Death
VI	Downie British Medical Journal, October 21, 1899, 1065	Male, 34	A somewhat pedunculated tumor over posterior portion of tongue present for five weeks	Spindle-celled sarcoma	Local excision
VII	Melchoir-Roberts Rev de Chirurgie, April, 1899, 545	Female, 64	A pedunculated tumor on right side of tongue present for three months, causing pain and fixation	Round and fusiform cells	Local removal, recurred <i>in situ</i>
VIII	Marion Rev de Chirurgie, 1902, 331	Female, 37	A pedunculated tumor of left side present for four months	Fusiform celled	Local removal, no recurrence

INCOMPLETE AND DOUBTFUL CASES

No	Reported by	Age and Sex	Clinical Condition	Histological Findings	Treatment and Result
I	Heath Transactions Pathological Society, London, vol ix, 1869, 167	Male, 60	Pain in and swelling of anterior portion of tongue for six years	Reported as adenocarcinoma, probably a mixed-cell sarcoma	Anterior half of tongue removed, no recurrence in nine months
II	Jacobi American Journal of Obstetrics, May, 1869, 81	Infant, 11 weeks	A swelling of tongue noted a few hours after birth, rapid increase	Spindle-celled sarcoma	Left half of tongue removed Result not stated
III	Huter Berlin klin Woch, 1869, 346		A tumor of central posterior portion of tongue for two months	Sarcoma	Removed
IV	Albert Wiener Med Presse, 1885, 171	Female, 56	A roundish tumor at root of tongue for eleven months, causing difficulty in swallowing	Sarcoma	Excision of tongue Death from pneumonia in eight days
V	Eyre Transactions Pathological Society, London, vol xxvii, 1886, 223			Fibrosarcoma	Museum specimen
VI	Godlee Transactions Pathological Society, London, vol xxviii, 1887, 346	Female, 24	An ulcerated tumor at tip of tongue for five weeks, a calcareous nodule at centre	Round or fusiform cells surrounding dilated cyst spaces, adenocarcinoma or mixed-celled sarcoma	Local removal, no recurrences
VII	Schulten Tinska Lakare-salls kapets Handlingar, 1888	Female, 32	A tumor at root of tongue, causing difficulty in swallowing	Sarcoma	Excision of tongue

VIII	Vandillon Soc de Med and Clin de Bordeaux, November 16, 1888	Female, 21	A tumor size of a pea at tip of tongue	Sarcoma	Three local removals; cured
IX	Targette Guy's Hospital Reports, 1873	Male, 10 months	A flat tumor under tip of tongue	Sarcoma	Local excision
X	Stern Deutsch med Wochen, June 2, 1892	Female, 4	A tumor of right edge of tongue present for one year	Fusiform-celled sarcoma	Local excision
XI	Onodi Rev de Laryngology, October 15, 1893	Female, 17	A tumor of left base, causing limitation of protrusion with pain on swallowing, mucous membranes intact	Elastic fibrosarcoma	
XII	Perman Buffalo Medical and Surgical Journal, 1894, 148	Female, 30	A tumor at base of tongue for five months, causing pain and spitting of blood	Sarcoma	Partial removal
XIII	Barker Holmes's System of Surgery, vol 11, 276		A pedunculated tumor of tongue with multiple sarcomata of skin		
XIV	Stedakovgrotzky Jahr v Vichow u Hirsch, 1873, 608		A tumor of submaxillary portion of tongue with metastases in pharyngeal glands	Large-celled sarcoma with fatty degeneration	
XV	Poucet Lyon Med, 1888, 95	Male, 32	Tumor of tongue for eight years	Fasciculated sarcoma	Excision of tongue, no recurrence in fifteen months
XVI	Eve Transactions Pathological Society, London, 1886, 223		A tumor of left base of tongue	Fibrosarcoma	
XVII	Bleything New York Medical Journal, 1888, 683	Male, 17	An ulcerated area near tip of tongue	Sarcoma	Cured by cauterization

Reported cases of sarcoma of the tongue have been brought together more particularly by Sheir in 1892 and by Marion in 1897 and 1902. The total list of these writers includes thirty-five cases. Another, more recent, case has been reported by Melchoir-Roberts, but of these thirty-six several, I am inclined to think, must be set aside on the ground of imperfect diagnosis, while others are valueless on account of the imperfect nature of the reports. Excluding these, the remaining cases become grouped into two forms,—the pedunculate and the interstitial. I have in the preceding tables classified these three orders of cases, giving, I believe, the salient points of each, so far as the reports have permitted. I shall not here discuss doubtful cases nor again pedunculate cases, these latter appear almost always, if not constantly, to be composed of fusiform cells,—to be, in short, spindle-celled sarcomata.

In the other variety, the interstitial, to which our case clearly belongs, there are several in which the details approximate closely to those here given of our own case.

Thus, Hutchinson's case, reported in 1885 in the *Lancet*, was that of a man, aged twenty-two, having a tumor upon the dorsum of the tongue in the posterior portion of the left half which had exhibited a steady, slow growth for twelve years. There were no enlarged glands, nor was there any fixation of the organ. The tongue was removed, but the growth recurred *in situ* two and a half years later, followed by death in a short period. The pathological diagnosis was small round-celled or lymphosarcoma.

Santesson reports a somewhat similar case in 1887. The tumor was in the left half of the tongue and had been growing for three years. There were metastases in the neighboring glands. The growth consisted of small round cells having a fibrous tissue reticulum which showed marked hyaline degeneration.

Butlin reported another case in the same year, that of a man of forty years who had suffered from a painful mass at the left side of the tongue. There was a single enlarged gland in the neighborhood, the covering epithelium was intact, and iodides were ineffectual. Here, also, the pathological diagnosis was that of lymphosarcoma, or small round-celled sarcoma. It is to be noted that after local excision there was no recurrence.

A third case, also in 1887, was that of Beregzazy. Here, too, the case was that of a man, aged forty-two, having a steadily growing tumor in the posterior portion of the tongue for about two years, with no difficulty in swallowing. There is no history given of local metastasis nor of

operation, but, death occurring, metastases were found in the peritoneum, most extensive at the attachment of the mesentery to the bowel, where small semilunar masses were present. Again the microscopical diagnosis was small round-celled or lymphosarcoma.

Sheir's case in 1892 was of the same order, though his patient was younger. A man aged twenty-eight had suffered for two years from a tumor at the base of the tongue, which had attained almost the size of an egg, and caused pain and difficulty in swallowing. It was removed through a submaxillary incision when it shelled out. There was an apparent capsule which also was removed. The growth, however, soon recurred in the floor of the mouth, leading to death fifteen months later. The microscopical diagnosis in this case was that of a small round-celled sarcoma, and it was noted in the report that besides the proper tumor cells there were collections or groups of cells exactly resembling lymphocytes.

Analyzing these cases, it will be seen that they all belong to the group of round-celled sarcomata, that they occur, not in early life, but in middle age, the majority between the ages of forty and fifty, though one occurred as early as twenty-eight, that extensive metastases in the neighborhood are rather the exception than the rule, and that other cases besides ours have shown lack of such local metastasis, that, as a body, they differ from the ordinary round-celled sarcoma in their relatively slow growth. Though local recurrence may take place, still, in Butlin's case and ours, it would seem to have been wanting. In Beregzazy's case, as in ours, though there was no local recurrence, metastases were found in the abdomen.

The clinical diagnosis of these tumors presents some little difficulty. They are distinguished from cancerous growth proper by the fact that the epithelium usually remains intact or only ulcerates after a long period. From gummata they ought to be distinguished by the therapeutic test. It is not always easy under the microscope to differentiate a gummatous growth from small-celled sarcoma. That is, there are portions of a gummatous growth which, from the abundance of small round cells, may be mistaken for a malignant connective-tissue neoplasm. But where the whole growth consists of the one order of cells with a mesh-work of well-developed connective tissue, there can be no doubt that we are dealing with a sarcoma proper.

Coming now to the different forms of sarcoma, we are immediately met with a difficulty regarding the terminology. It will be seen from what I have stated that the majority of these cases have been regarded as possibly lymphosarcoma. This term is a bugbear to the modern pathologist, for it is employed by different individuals with different meanings. Thus, many American authorities appear to confine the term largely to the overgrowth of lymph-glandular tissue in pseudoleukæmia. French writers employ the term, it would seem, for any small round-celled sarcoma that shows an intracellular reticulum at all resembling that seen in true lymphoid tissue, while many English writers employ it as synonymous with small round-celled sarcoma. Nor do I feel wholly convinced that it is possible to make an absolute distinction between the small round-celled sarcoma and the lymphosarcoma, for, stained with one of the connective-tissue stains, such as Mallory's, undoubtedly the true small-celled sarcoma does possess an intracellular reticulum. It would be better if, under these circumstances, the use of this term were wholly done away with until an absolute histological differentiation is afforded between the two varieties, if such truly exist, or, with the German authorities, to apply the term purely to those cases where there can be no question of the growth having originated in true lymphoid tissue. I would only add that, while the growth in our case cannot be described as one of the smallest of the round-celled sarcomata,—as a lymphocytoma, if I may coin the word,—the relationship of the small deeply staining cells present to the other cells would appear to indicate that this case of ours falls well into line with the others described as small round-celled (or lympho-) sarcoma.

Lastly, as to treatment. That most in favor is wide excision of the tumor. This may result in cure. While there may be recurrence, either local or distant, the results here given seem to justify that this be recommended. The slow growth of many of these tumors would also seem to suggest that if excision be done at an early date, the results should be most favorable. In our case, owing to the opposition of the patient,

only partial excision was performed, but this partial excision, while it led to the arrest of the growth locally, may, I would suggest, have been not unfavorable to the escape of the tumor cells and to the establishment of distant metastases

In conclusion, I wish to express my thanks to Professor Adam for advice and in the preparation of the foregoing

I removed the entire larynx, following quite closely the technique as elaborated by Keen, of Philadelphia. A median incision was made from above the hyoid bone to a point one and one-half inches above the sternum. The trachea was dissected free, necessitating division of the isthmus of the thyroid. The trachea was divided across between the third and fourth rings, and the lower portion drawn forward and downward and attached to the skin by a number of catgut sutures. A tracheotomy tube was then inserted and the anæsthetic continued through it. With the patient in the Trendelenburg position, the larynx was excised, a rather difficult procedure in this case, owing to adhesions due to the previous operations. An abscess cavity was found extending along the left cornu of the hyoid bone. The epiglottis was dissected out separately, except a small portion of the tip, which was unintentionally left. The mucous membrane of the pharynx was next sutured together with catgut, and a few sutures employed to bring together the muscles of the pharynx. The hæmorrhage was not severe, and was mostly from the thyroid isthmus. The greater part of the wound was closed with silk-worm gut, with a cigarette drain in the abscess cavity along the hyoid. The tube in the trachea was removed and an open pill-box covered with moist warm gauze placed over the trachea. Chloroform was the anæsthetic used. The anæsthetist's record of blood-pressure and pulse showed no marked shock during the operation, but for a couple of hours after the operation, with the patient still in the inclined position, the pulse was almost imperceptible, and the respirations were reduced to four per minute. Oxygen and stimulants were administered and had the desired effect.

Two days after the operation the patient was allowed to drink sterile water. Four days later, patient was up and around and could eat soft food. One month after the operation the patient had gained seventeen pounds, and, except for a small discharging sinus which was believed to be due to the infection along the hyoid bone, he was apparently perfectly well. A Gluck phonation apparatus was fitted on him and he went back to his home. He was under the care of Dr T J Patterson, of Visalia, at intervals, but the sinus still refusing to heal, and a hard mass being felt at the bottom of the wound, Dr Patterson advised him to come back to me for further treatment.



FIG 1 —Result after total extirpation of larynx. Patient wearing the phonation apparatus of Gluck

February 11, 1904 I excised the hard mass, which was half the size of the original larynx and quite closely attached to the œsophagus. During its extirpation a small portion of the anterior wall of the œsophagus was removed. This defect was readily closed with a double row of catgut sutures and the wound closed with a cigarette drain.

Examination of the mass shows a considerable amount of bony cartilage, which probably grew from the perichondrium left behind, and softer tissue which is epitheliomatous. As to the final outcome of this case, I still hope to report a favorable result. The mistake I made was in not insisting upon a total laryngectomy at the first sign of recurrence, although it is doubtful if the patient would at that time have consented to the procedure.

The division of Krishaber, of cancer of the larynx into intrinsic and extrinsic forms, seems an important one from the standpoint of prognosis as well as treatment. The intrinsic cancers are those beginning in the vocal cords, the ventricular bands or the parts below, while the extrinsic start in the epiglottis, the arytenoids, or the other portions of the pharynx outside of the larynx proper. In the former the growth increases slowly, metastases to the lymph-nodes are rare and late in the disease, and there is little tendency for the tumor to extend beyond the limits of the larynx. In the extrinsic forms the lymphatic involvement is early, the course is more rapid, and the contiguous structures in the neck are apt to become affected. It will be readily understood, then, that the prognosis of the extrinsic form is more grave than that of the intrinsic. Fortunately, however, the former occurs about half as frequently as the latter.

It is not within my province or the scope of this paper to consider the symptoms of malignant disease of the larynx nor the matter of diagnosis, except in so far as it involves the removal of tissue for examination. It has been shown that a microscopical diagnosis may be entirely misleading when the bit of suspected growth has been removed by an intralaryngeal operation, the cancer-cells may be deeply seated in the mucous

membrane and escape the grasp of the instrument. One prominent laryngologist, Mackenzie, of Baltimore, objects to the intralaryngeal removal of pieces of tissue, fearing infection at the point of incision, the stimulation of the local growth and metastases elsewhere, but, as a microscopical examination can be made inside of twenty-four hours, those objections would scarcely hold good, providing the patient were immediately operated upon. If, after a careful clinical study, a diagnosis of cancer is made and the microscopical findings are not in harmony with it, I believe that a laryngotomy is in order for the double purpose of removing sufficient tissue for further examination and of doing whatever is necessary in an operative way.

Laryngotomy can and should preferably be done under local anæsthesia, and if one can secure the services of a competent pathologist, sections of the growth can be made and reported upon in about fifteen minutes. If the report is favorable, the wound can be closed and the damage to the larynx, if any, is slight. If, on the other hand, the diagnosis of cancer is confirmed, the operative treatment may be proceeded with according to the plan which seems best.

We come now to the question of treatment. There is no medicinal treatment which has proved of any avail in malignant disease of the larynx. The X-rays have been used in a number of cases with two or three reported cures (Cott, Scheppegegrell), but I fear the history of that treatment will be similar to that we are now obtaining from those who have used the X-rays for malignant disease elsewhere,—a large proportion of recurrences after apparent cures (Coley). In my own case the epithelioma continued to grow despite the direct application of the rays through a fissure of the larynx. Mention should be made of a simple tracheotomy as a palliative measure to be used in some cases so far advanced that all hope of radical treatment is out of the question.

When we come to consider the operative treatment, we have at our command five different procedures. 1. The intralaryngeal removal as advocated especially by B. Fraenkel and

Jurasz 2. The removal by laryngo-fissure, to which the names of Sir Felix Semon and Mr Butlin are often attached 3 The subhyoid pharyngotomy of Malgaigne as perfected by Kocher. 4 The more radical removal by partial excision 5. Total extirpation as first performed by Watson and Czerny and perfected by Gluck and others

I cannot but believe that the intralaryngeal method is based on a wrong principle, for the efforts to thus eradicate a disease which early invades structures quite remote from the original focus are wasted in the great majority of cases and valuable time is lost It is true that a few cures have been reported, but they are the exception and not the rule

Laryngo-fissure, or laryngotomy, is considered by a number of authorities (Semon, Butlin, v Bruns, Moure) as the normal procedure The results have been very good in the hands of the above-mentioned observers, while many others have reported poor results, probably owing to the fact that the limitations of the method were not well understood Semon states that "The operation must be restricted to early stages of intrinsic malignant disease," while Moure, of Bordeaux, is more specific, and says, "It ought to be reserved exclusively for malignant growths originating in the interior of the larynx, and especially for tumors of one or other of the vocal cords When one of the ventricular bands is affected, when there is peripheral infiltration, still more when the corresponding arytenoid cartilage is fixed, or when there are signs of perichondritis, it is unsuitable, and ought to be rejected as a means of cure" The operation is quite simple as a rule Under 1 per cent cocaine anæsthesia the skin is incised from the hyoid bone to below the cricoid cartilage, and the thyroid and cricoid cartilages divided exactly in the median line The head should be hanging over the edge of the table or the whole body should be elevated in order to prevent blood running down the trachea As the edges of the cartilage are spread apart, a solution containing cocaine 5 per cent, antipyrin 5 per cent, and carbolic acid 1 per cent, should be painted over the interior of the larynx I should think that the local use of

adrenalin would also be of value. In a few minutes the laryngeal reflex will be abolished and a thorough view of the interior may be obtained. One is often surprised to find a very much worse condition than was apparent on laryngoscopic examination. The malignant growth, if still confined to the cords, should be excised, together with a wide margin of normal mucous membrane. The larynx should then be accurately closed by catgut sutures. Some operators leave a tracheotomy tube for a day or two, but it can generally be dispensed with. Subhyoid pharyngotomy by the transverse incision of Kocher gives a good exposure of the upper portion of the larynx and the adjoining pharynx. For the extrinsic malignant growths of the larynx it is often useful.

Partial laryngectomy involves a technique not very dissimilar from the total excision, and needs but a few words of comment. The larynx is divided in the median line as in a laryngo-fissure, the diseased half isolated by a careful dissection close to the cartilages, and, when the posterior aspect is made free from the œsophagus, it should be divided also in the median line. A tracheotomy tube is introduced into the lower portion of the wound and the soft parts closed over the remaining half of the larynx. In a number of reported cases the results were excellent, especially as regards phonation and cosmetic appearances.

The best method of total laryngectomy is, I believe, that elaborated by Keen, who combined a number of procedures devised by other men into a good working plan. The principal steps of his operation have already been mentioned and need not be repeated.

The removal of the larynx under local anæsthesia is feasible, and has been performed by at least one operator (Davis), but chloroform will probably continue to be the anæsthetic of choice. I believe, however, that the suggestion of Crile to apply cocaine to the interior of the larynx will diminish laryngeal shock. In another case I should have the larynx thoroughly cocaineized some minutes before the operation.

Foderl's method of uniting the stump of the trachea to

the epiglottis and the aryepiglottic folds or to the hyoid bone, is a valuable operation when the trachea can be sufficiently mobilized to permit of its attachment so high up without undue tension. A possible objection to the operation to me is the danger of malignant disease of the trachea, in case of a recurrence in the wound, preventing any further operative measures.

The laryngoplastic operations of Gluck are particularly useful when the œsophagus, pharynx, or other structures adjacent to the larynx are involved in the cancerous process. Gluck has achieved wonderful results through his extensive and bold dissections, and his example is sure to be followed—in this country at least.

The statistics of operations for the relief of malignant disease of the larynx are, as Delavan has well shown in a paper before the American Laryngological Association in 1900, of no value, because they are based upon insufficient reports of cases, because many cases are not reported at all, and because the final results are seldom obtainable. The statistics of some individual operators, however, are of value, and show a steady improvement in the mortality and the recurrences. The greatest danger of the major operation on the larynx is pneumonia, generally of the inhalation type, but improvements in operative technique have led to a marked lessening of this danger.

The use of an artificial larynx is advisable in certain cases, and the form of it will depend largely upon the character of the wound. Where there remains a communication between the trachea and the mouth, the instrument selected will be of the type devised by Gussenbauer or its various modifications. When, however, the trachea is attached to the skin of the neck low down and the pharynx is closed, the phonation apparatus of Gluck is very useful, as may be noted in the case of the patient here presented (Fig. 1). With this apparatus he can speak very plainly. I can understand him at a distance of fifty feet or more. The apparatus consists simply of a metal box fitting accurately into the outer end of a tracheotomy tube which is worn during the daytime. The box has an inlet for air provided with a valve, while the exit for the air is through

a tube running up into the mouth. In the course of this latter tube is the so-called voice,—a pitch-pipe in my case, as I have been unable to secure the Gluck apparatus. Sometimes the tube is inserted through a nostril to the nasopharynx just behind the uvula, and in other cases it is passed into the mouth through a permanent opening in the cheek. The last-mentioned route seems to me unnecessary. In the more extensive operation of Gluck, when removal of part of the œsophagus is necessary, a prothetic appliance for it as well as for the trachea may be demanded. Freund succeeded in making a very ingenious contrivance which was quite efficient.

REFERENCES

- von Bruns. Handbuch für prakt. Chirurgie, Band 11, p. 222.
 Butlin. The Operative Surgery of Malignant Disease, 1900, p. 187.
 Cott. Journal of the American Medical Association, December 5, 1903, p. 1411.
 Davis. ANNALS OF SURGERY, 1901, Vol. XXXIII, p. 32.
 Delavan. New York Medical Journal, September 15, 1900, p. 449.
 Foderl. Archiv für klinische Chirurgie, Band LVIII.
 Freund. Archiv für klinische Chirurgie, Band LVIII, p. 339.
 Gluck. British Medical Journal, October 31, 1903, p. 1119.
 Keen. ANNALS OF SURGERY, 1899, Vol. XXV, p. 1, and Transactions of the American Surgical Association, 1899, Vol. XVII, p. 1.
 Kocher. Operationslehre, 1902, p. 186.
 Mackenzie. New York Medical Journal, September 8, 1900, p. 397.
 Moure. Journal of Laryngology, Rhinology, and Otology, December, 1903, p. 648, and British Medical Journal, October 31, 1903, p. 1148.
 Scheppegegrell. Journal of Laryngology, Rhinology, and Otology, February, 1903, p. 70, and New York Medical Journal, December 6, 1902.
 Semon. British Medical Journal, October 31, 1903, p. 1113.

A SELF-RETAINING ABDOMINAL RETRACTOR.

BY F F SIMPSON, M D.,

OF PITTSBURG, PA

WORKING space, light, and range of vision are important factors in producing speed, accuracy of detail, and ease of execution in operative work done deep in the abdomen and pelvis. In pelvic work, Trendelenburg posture and marsupialization by gauze have removed many technical difficulties. The remaining obstacle, viz, the abdominal wall, at times causes very annoying interference and delay, necessitating a choice between an incomplete toilette and prolonged narcosis. The immediate and remote consequences of such defections as bleeding radicals, weeping raw surfaces, and exposed pedicles are apparent. So is the depression of all vital forces due to prolonged and profound ether narcosis. Of special moment in this connection is the decreased resistance to bacterial invasion, which occasionally determines a fatal issue.

There are times during most deep operations when an open abdominal wound facilitates work. With the hope of simplifying the methods by which this may be accomplished, I have had made a self-retaining retractor which can be easily and speedily inserted, removed, or adjusted to a nicety. It is opened or closed by an accustomed group of muscles, those used for hæmostats or scissors being brought into action. To avoid intricate mechanism, these retractors are composed of only two pieces, and are made in three sizes for abdominal walls of varying thickness. The blades are not detachable, and consequently require no especial manipulations to place them. They are small, slender, curved, hug the abdomen, and keep well out of the way. They occupy much less room than the ordinary single retractor and the hand that holds it. The ratchet is like that of an artery forceps, and consequently requires no individual handling for adjustment. This instru-

ment can be used to the same extent and with the same ease and facility as a single hand retractor. When in position, it not only gives a good view of the interior, but liberates both hands of the assistant.

I have found it a space-maker and a time-saver, and commend it for those qualities. The writer is familiar with other similar instruments, such as that of Collins.

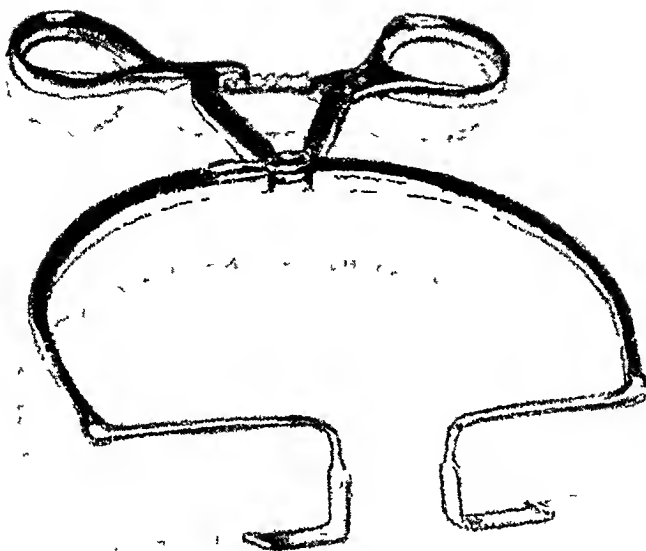


FIG 1 — A self-retaining abdominal retractor

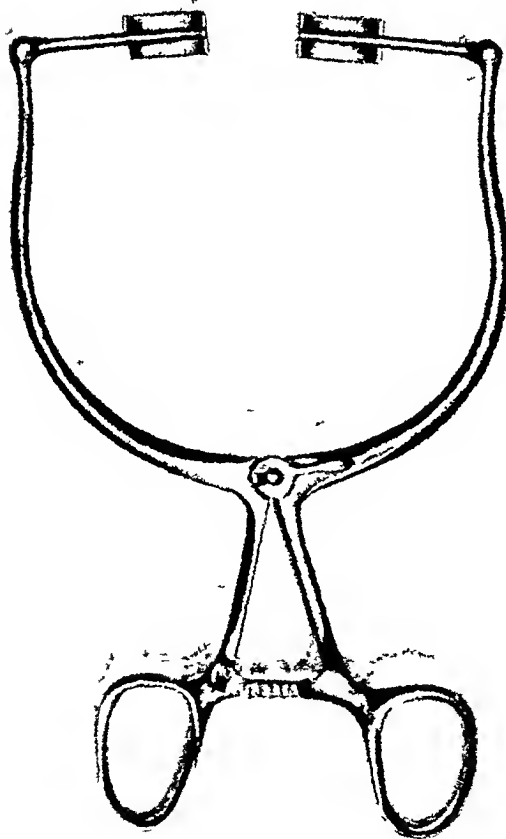


FIG 2 — A self-retaining abdominal retractor

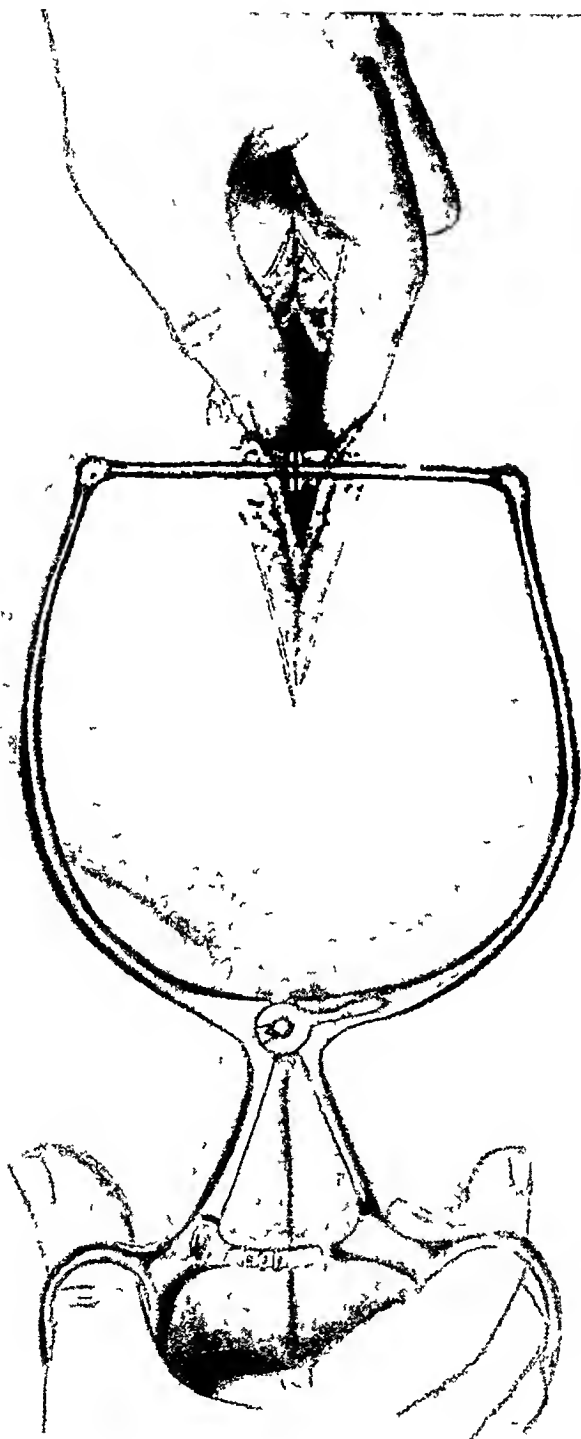


FIG 3—Manner of introducing self retracting abdominal retractor

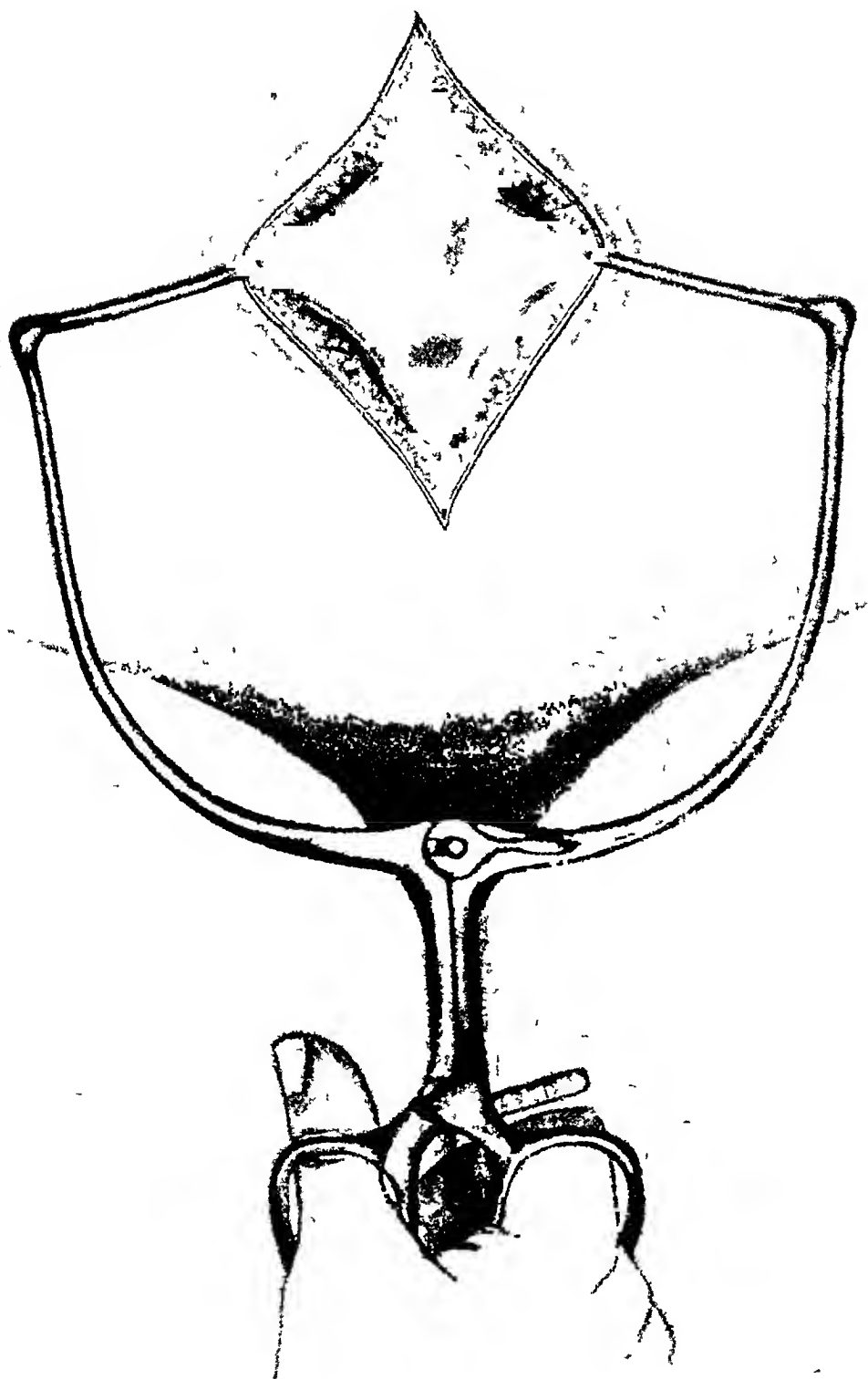


FIG. 4.—A self-retaining abdominal retractor being adjusted

EXTENSIVE SUBCUTANEOUS LACERATION OF THE ABDOMINAL MUSCLES.

BY DANIEL N EISENDRATH, M.D ,
OF CHICAGO,

Adjunct Professor of Surgery, College of Physicians and Surgeons, Attending Surgeon,
Cook County Hospital

THE subject of serious injuries of the abdominal viscera is attracting more and more attention every day. Many cases have been reported of ruptures of the solid and hollow abdominal viscera, without evidence of any injury of the skin or of the abdominal wall, in which early recognition and operation achieved a successful result.

The following case illustrates that a rupture of all of the abdominal muscles may occur, with insignificant injury of the skin. The writer has been unable to find any record of a similar case in which recovery occurred.

The patient, P F, aged fifty years, a laborer by occupation, was admitted to my service in the Cook County Hospital on the 1st of June, 1903. He gave the following history. About one hour before admission, while intoxicated, he had been caught between the sides of two street-cars, passing in opposite directions, in an effort to save himself from being run over. These cars are so wide that when they are on adjacent tracks only a narrow space, not sufficient for an adult to stand, is left. A companion who was similarly caught and crushed was brought to the hospital dead.

My patient was carefully examined by the house surgeon, Dr Snyder, who found a swelling about the size of an orange at the middle of the right iliac crest, and extending somewhat below it. From the fact that this tumor was distinctly tympanitic on percussion and could be made to disappear into the abdominal cavity with a gurgle, he made the diagnosis of a traumatic hernia through the triangle of Petit. The writer saw the man three hours after the injury, and confirmed the findings of Dr Snyder. The swelling described above was distinctly noticeable, was tym-

panitic, and when its contents were reduced I could feel a gap in the abdominal wall just above the middle of the right crest of the ilium, which readily admitted four finger-tips. The pulse was 108, and there was only slight evidence of shock. Further examination showed a fracture of the fifth and sixth ribs of the left side, and a fracture close to the acromial end of the left clavicle. There were several small hæmatomata over the right gluteal region, and a few ecchymoses into the skin of the right side of the abdomen. The skin otherwise was intact. Owing to the refusal of the patient to consent to immediate operation, the latter was not performed until sixteen hours after the injury. There were now evidences of peritoneal irritation, *e g*, increased pulse, tympanites, and tenderness. After the usual preparation, an incision was made over the site of the swelling at the middle of the right crest of the ilium. Upon cutting through the skin, a remarkable condition was found. The only structure which separated the general peritoneal cavity from the external world was the skin. All of the muscles attached to the crest of the ilium (external and internal oblique, and transversalis muscles), as well as the transversalis fascia and peritoneum, were torn loose from their attachments. The skin incision was enlarged in both anterior and posterior directions, and the flaps retracted. It was now found that the injury was far more extensive than we had supposed. From the quadratus lumborum posteriorly to the middle of Poupart's ligament in front every structure which is normally attached to the crest of the ilium and outer half of Poupart's had been torn from its attachments. The lower edges of the muscles were irregularly torn and contused. The general peritoneal cavity had already been partly walled off by adhesions between the ascending colon (which had been displaced inward) and the anterior abdominal wall. In the iliac fossa were many loose pieces of omentum. The ascending colon was contused and dilated. There were no other visceral injuries.

The repair of this great defect presented a difficult problem. I was at a loss how to secure a firm attachment for the torn muscles. To insert sutures through holes drilled in the crest of the ilium would consume too much time. I decided to make use of the tough aponeurotic character of the gluteal fascia, and by drawing the muscles down to it was able to close the defect completely with fourteen kangaroo tendon sutures. I inserted

these upon the mattress suture principle, by catching all of the abdominal muscles in the upper loop of the suture, and then pulling the entire mass, including transversalis fascia and peritoneum, down over the outer side of the iliac crest, and holding it in place by a similar loop which caught up a considerable area of the gluteal fascia, and then tied the suture. From the anterior superior spine of the ilium to the middle of Poupart's ligament, mattress sutures of kangaroo tendon were passed in a similar manner through the muscles *en masse*, and these then anchored by passing the two ends of the suture through Poupart's ligament itself, similar to the formation of the posterior wall of the inguinal canal in the Bassini operation. Small gauze drains were inserted at each end of the long skin incision. These were removed after forty-eight hours.

Primary union occurred, and the patient made a slow recovery (Fig 1). Convalescence was delayed by a left-sided pneumothorax and a left-sided thrombophlebitis of the femoral vein.

Examination of the patient nine months after the injury shows no recurrence of the hernia. Even hard straining and coughing fail to reveal any bulging or impulse. He now has a left-sided inguinal hernia, which he claims not to have been present before the injury.

REMARKS ON THE RADICAL CURE OF FEMORAL HERNIA

BY FREDERICK KAMMERER, M D,

OF NEW YORK,

Professor of Clinical Surgery in Cornell Medical College, Surgeon to the German
and St Francis's Hospitals

THERE seems to exist to-day very little difference of opinion among surgeons as to the proper operative procedure for the radical cure of inguinal hernia. With very few exceptions, the method of Bassini is generally used. Some surgeons, not many, are inclined to favor the Kocher operation, claiming that equally good results can be obtained by it, and that the method from a technical point of view is more simple. If this is so, it would seem that some other factor must influence surgeons in their choice, and I think the same is nothing more or less than the conviction that the Bassini method rests upon sounder and more rational anatomical and mechanical principles than the others. As we all know, the conditions to be fulfilled are the exact closure of the internal opening of the inguinal canal, and the easy approximation of tissues to accomplish this purpose. When we speak of closure of the internal ring, we naturally have in mind the artificial production of a firm, thick layer of tissues, resisting the pressure of the intra-abdominal viscera, as it is obtained by the suture of the movable edge of the internal oblique, and perhaps transversalis muscle to Poupart's ligament. Great stress has often been laid upon the avoidance of a funnel-shaped projection of peritoneum at the site of the internal opening, both in inguinal and femoral hernia. While I can fully appreciate its importance as a factor in favoring recurrence after radical operation, when the tissues underlying the peritoneum are also funnel-shaped at that point, I have never really understood what it mattered whether high or low ligation of the sac was practised, the sac removed, or replaced within the abdominal cavity as a pad, as long as a

firm layer of tissue was placed at the site of the internal opening of the canal with its inner surface in the same plane as the inner surface of the abdominal wall

Does the history of radical cure of femoral hernia during the past ten or fifteen years teach us that similar considerations have led surgeons in the choice of the methods employed? I do not think so. Let us consider for a few moments the operations that have been in vogue for the cure of femoral hernia during this time. According to Bacon, who has written an excellent and exhaustive article on the subject, an operation was undertaken by Dr Jameson, of Baltimore, in 1828, during the course of which he transplanted the free border of a skin-flap into the external femoral opening, suturing the skin over the same. Dr Jameson claims to have achieved a permanent result by this procedure. In the seventies and eighties of eighteen hundred, operations for reducible femoral hernia were rarely undertaken, and then the surgeon was content to ligate and remove the sac and to suture the skin incision. Socin, in 1879, speaks of six cases which were apparently permanently cured in this manner. Heidenthaller, in 1890, after a thorough survey of the literature, asserts that recurrence is rarer in cases in which no attempt has been made to close the saphenous opening by sutures than in the cases in which this has been done, although, on the other hand, the unsutured cases recur sooner than those in which a suture has been applied. Bassini published his method in 1894. It is to my knowledge the first systematic attempt to add to simple ligation and removal of the sac also closure of the femoral canal. As I understand Bassini's operation, it consists in bringing the superior cornu of the falciform border and that part of Poupart's ligament lying behind it into contact with the pectineal fascia by three sutures beginning immediately to the outside of the pubic spine. Three or four additional sutures unite the falciform border in its vertical portion with the corresponding parts of the pectineal fascia, leaving only sufficient space for the entrance of the saphena magna beneath the lowest suture. I have no personal experience with this method, it never having appealed to me,

as it practically only closes the external femoral ring. The same I think can be said of the various forms of the purse-string suture, which, if anything, only creates greater tension. Coley has lately reported sixty-six operations, in fifty of which the purse-string suture was used and in sixteen the method of Bassini. Of these he has been able to trace all but eight cases. It is regrettable that Coley does not elaborate his statistics further, telling us whether or not these eight cases belong to his earlier operations, and which of the two methods were employed in each of them. The larger number of his traced cases were operated upon during the last three years, a time-limit which does not warrant very definite conclusions as to ultimate results. I have previously alluded to the statistics of Heidenthaller, who has shown that femoral herniæ, in which the external femoral opening has been sutured, recur very late, on an average after two years.

Fabricius published a new method in 1895. It is a distinct advance over the purse-string or interrupted suture of mainly the external femoral opening as heretofore practised. Fabricius evidently appreciates the difficulties of approximating inelastic tissues by the aid of sutures. He therefore seeks to obliterate the opening at the internal femoral ring by dividing the superior cornu and even the fibres of Poupart's ligament, which are attached to the pubic spine to such an extent that all tension is relieved and the parts can be easily sutured to Cooper's ligament. Half a dozen sutures are employed for this purpose. In his article, Fabricius speaks of an operation for femoral hernia by Weinlechner, in which that surgeon succeeded in closing the femoral canal, but found at the expiration of eight months a bulging at the site of the external inguinal opening, and he, therefore, concludes that it would be wise, as a final step of his own operation, to close the latter in women, and to reduce its lumen by drawing together the two pillars of the ring with two or three sutures in men.

In 1896, Tuffier published his method of radical cure. He makes an incision parallel to Poupart's ligament, cutting through the aponeurosis of the external oblique. He then



FIG 1 —Showing cicatrix of skin wound made to expose subcutaneous laceration of abdominal muscles

works down upon the neck of the sac between Poupart's ligament and the internal oblique, liberating it from the surrounding subperitoneal tissue. This step is a distinct innovation in the operation for femoral hernia. The incision above Poupart's ligament greatly facilitates further operative measures in cases of strangulation. It enables the surgeon to approach the seat of trouble from above, a decided advantage when intestinal gangrene has set in. In such cases Tuffier divides Poupart's ligament, cutting from without inward, thus insuring greater safety during the further manipulations, with a view to prevention of general peritoneal infection. Tuffier further mentions the fact that Poupart's ligament can be much more readily sutured to the pectineal fascia after it has been cut, although he does not recommend its division as a routine practice. Suturing Poupart's ligament to the pectineal fascia from above through the original incision in the aponeurosis is the last step of Tuffier's operation for radical cure, whether Poupart's ligament has been divided or not. It is rather curious that Tuffier should not have thought of suturing the tissues on the upper side of his incision (the fibres of the internal oblique and transversalis muscle) to Cooper's ligament, more especially as the operation of Bassini for inguinal hernia, based on similar anatomical considerations, was well known to surgeons at the time, and generally accepted.

Lotheissen was evidently the first to apply the principle of closure of the internal opening in Bassini's operation for inguinal hernia to the radical cure of femoral hernia. In May, 1898, he published a method, the principal steps of which were in succession

- 1 An incision parallel to Poupart's ligament and a little above the same, dividing the fibres of the external oblique. This incision extends into the external inguinal ring.

- 2 Exposure of the neck of the sac by entering between Poupart's ligament and the internal oblique muscle.

- 3 Dislocation of the sac by pulling the same, if small, into the opening above Poupart's ligament.

- 4 In large herniæ, dissection of the skin at the lower edge

of the original incision, exposure of the external surface of the sac, incision and reduction of its contents into the abdominal cavity, deligation and removal of the sac, and finally dislocation of the stump of the sac in the manner previously described for small herniæ

5 Suture of the edge of the transversalis and internal oblique muscles to Cooper's ligament

6 Suture of the incisions in the aponeurosis and the skin separately

Shortly after Lotheissen's publication, I had occasion to operate upon a middle-aged woman with a femoral hernia of moderate size, at St Francis's Hospital, in which I employed the method. The patient did very well, and the immediate result of the operation was excellent. I am sorry to say that my attempts at the present time to trace her have been unsuccessful. As the operation seemed to me somewhat more difficult than the method of Salzer, which I had used in a few cases, I again abandoned it in favor of the latter. Salzer's operation consists mainly in plugging the femoral canal with a flap from the pectineal fascia, having its base upward. This flap, which I have generally made to include a layer of muscular tissue from the pectineus itself and which in persons who have worn a truss is quite firm, is turned upward and sewed to Poupart's ligament. I have done this operation ten times during the past four or five years.

It is important to remove the loose cellular tissue lying within the femoral canal and on the pectineus muscle before defining the flap with a knife. This step, according to Salzer, insures firmer union of the reflected flap. It lengthens the operation somewhat and, as I now believe, reduces it to a procedure of about the same dignity as the Lotheissen operation. I must express my envy and admiration of those surgeons who are able to trace so many of their patients years after operation, and apologize for my own shortcomings in this direction. Only two of the ten patients mentioned have responded to my written invitation to present themselves for examination. They were a woman of thirty-four, operated

upon in May, 1902, with a right reducible femoral hernia, who has worn no truss since, and in whom there is no recurrence, and another woman, fifty years old, with a double femoral hernia, the left having been irreducible for several years, and about the size of a fist, who was operated upon in April, 1902, and also has not worn a truss. There is no recurrence on either side.

Last fall my attention was again directed to the Lotheissen procedure by an article, in the *Centralblatt für Chirurgie*, by Gilli. The author tells us that the operation has become the typical one for femoral hernia at von Hacker's clinic since Lotheissen's first publication, and that the results which have been obtained with the same are very good. The special object of his publication, however, is the recommendation to divide Poupart's ligament after incision of the aponeurosis of the external oblique in cases of strangulation. Gilli is evidently not aware of Tuffier's recommendation in this regard previously mentioned. In November of last year, shortly after noticing the above-mentioned article, I had occasion to operate on an incarcerated femoral hernia of very large size, containing adherent omentum and a large knuckle of small intestine very much discolored. I resorted to Lotheissen's operation with division of Poupart's ligament immediately over the neck of the sac, cutting from without inward. I was very much impressed with the truth of the contention, that operating in this way facilitates division of the constricting ring and permits of an exposure of the contents of the sac without passing through possibly infected tissues before opening the general peritoneal cavity. The five other cases of femoral hernia on which I have operated during the past four months were all in women, and included one irreducible and four reducible herniæ. In none of them was I obliged to divide Poupart's ligament, for the sac could always be drawn out beneath it, in an upward direction, when the femoral vein had been exposed and pulled aside with the aid of a blunt retractor. In the case of irreducible hernia I was obliged to expose the sac from its crural aspect, to resect a considerable portion of adherent omentum, to ligate

the sac, and to push back the stump beneath Poupart's ligament, so as to bring it out in the original incision. The suturing of the internal oblique and transversalis muscle to Cooper's ligament never gave me any trouble, although the latter lies deep in the wound.

The method, I think, should find more favor among surgeons than has hitherto been the case, to judge from personal communications. It was made the subject of a classical essay some years ago by Bacon, who, however, calls it Gordon's operation. Gordon's first publication on the subject appeared in the *British Medical Journal* in 1900. He describes an operation which resembles Lotheissen's in all essential particulars, the only difference being the continuation downward over the hernia of the inner end of the original skin-incision, which more fully exposes the sac from its crural aspect. The operation was again described by Parry in 1901. No mention is here made of Lotheissen's publication, not even of Gordon's, whose communication appeared in the same journal. Parry makes a curved incision through the skin with its convexity downward from a point a little external to the pubic spine to the middle of Poupart's ligament. He separates and opens the sac below the ligament, but he does not remove it unless it is small and its walls are thin and torn. On the contrary, after a further incision through the aponeurosis, he doubles up the sac and fixes it with a suture beneath the abdominal wall.

The essential feature, however, of the operation, as in the others mentioned, is the attachment of the internal oblique and transversalis muscle to Cooper's ligament. From what has been said, it would appear that the individual steps of this operation may be executed in different ways. I think the best incision is the one parallel to Poupart's ligament and about a quarter of an inch above it. In reducible herniæ it seems to me entirely unnecessary to expose the sac from its crural aspect, in order to dissect out all the fat, loose connective tissue and lymphatics from the femoral canal, and to positively identify the femoral vein. The identification of the latter can be just as easily accomplished from the incision into the aponeurosis,

whereby much time is saved While thorough cleaning out of the femoral canal, as above indicated, will no doubt somewhat facilitate the later application of sutures through the incision into the aponeurosis, this is distinctly an anatomical proposition The surgical point of view, so often lost sight of, is a different one Is this slight advantage commensurate with the disadvantage of a longer operation and of a larger wound surface? I do not think so in small herniæ, in fact, in all herniæ, in which the hernial sac can be easily delivered through the incision in the aponeurosis In large, non-strangulated herniæ it will be more advisable to begin the operation by exposing the sac where it emerges from the saphenous opening In dealing with strangulated femoral herniæ of whatever size, after incising the aponeurosis and exposing the neck of the sac, I should always hereafter divide Poupart's ligament, entering the sac or even the general peritoneal cavity immediately above the hernia I frankly confess that I have often felt dissatisfied with my subsequent work on having opened a gangrenous femoral hernia from below Dividing the constriction from within in an outward direction is a procedure which should be relegated to the past, and cross-section of Poupart's ligament from without, cutting down upon the neck of the sac, is much more satisfactory when it starts from a previous incision into the aponeurosis of the external oblique In my own case of strangulation, mentioned above, I did not attempt to reunite the cut ends of Poupart's ligament, fearing too much tension I fastened the ligament, however, with several stitches to the internal oblique muscle, after the latter had been sewed to Cooper's ligament

In closing, I naturally disclaim any desire to formulate conclusions as to the ultimate results of the Lotheissen operation from my personal experience The only case upon which I could base the same is the one operated upon about five years ago, and this case I have been unable to trace The other six have been operated upon during the past four months only However, quite a large number of cases have been published by other surgeons at this time, and I fail to find any recurrences

mentioned. This is not absolute proof, but it speaks well for the method. When we remember that most femoral herniæ can be radically cured by simple ligation and removal of the sac, that some of them recur even five years after operation (Schede), we must concede the difficulty of compiling satisfactory statistics on this subject, as the question at issue only involves a small percentage of all the cases operated on. We should, therefore, give preference to methods of procedure which are based on the best anatomical and mechanical principles, when the latter so wholly govern the problem to be solved. I am of opinion that the Lotheissen-Gordon method more thoroughly meets these requirements than any other.

LITERATURE

- Bacon. Yale Medical Journal, 1901
 Bassini. Archiv fur klinische Chirurgie, Vol. 1711
 Berger. Duplay and Reclus, Traite de Chirurgie, Tome vi
 Coley. ANNALS OF SURGERY, Vol. xxxiv, 1901
 Fabricius. Wien klin. Wochenschrift, 1895
 Gilli. Centralblatt fur Chirurgie, 1903
 Gordon. British Medical Journal, 1900, Vol. 1
 Heidenthaller. Archiv fur klinische Chirurgie, Vol. 171
 Kocher. Operationslehre
 Lotheissen. Centralblatt fur Chirurgie, 1898
 Parry. British Medical Journal, 1901, Vol. 11
 Salzer. Centralblatt fur Chirurgie, 1892

EXPERIMENTAL SURGERY.

WORKING PLANS OF A SANITARY ANIMAL CAGE FOR LABORATORY USE

BY DONALD GORDON, JR.,

AND

J W DRAPER MAURY, M D.,

OF NEW YORK

THE animal cage herewith described has been run to its full capacity since its completion, early in November, 1903. It has therefore undergone adequate trial in the Surgical Laboratory of Columbia University, and it has successfully accomplished the ends for which it was designed. So thoroughly practical and serviceable in every way has it proved, that working plans for its construction are presented in the hope that they may be useful to others engaged in experimental work.

It is believed that with the aid of these sketches an ordinarily intelligent carpenter can construct a similar series of cages without the least trouble. Should, however, any difficulty be experienced, we shall gladly answer any questions bearing on points which are not made clear. That the construction is not difficult is attested to by the fact that we built the cages with our own hands.

The plans presented are intended merely to facilitate the keeping of animals in healthy sanitary condition. By placing a metal tray beneath the screen flooring, however, in such manner as to catch all excreta, one would be enabled to carry on physiologico-chemical researches in conjunction with those of a purely surgical nature.

All the screens used are made of galvanized steel, which we obtained cut to order from the Clinton Wire-Cloth Company, 76 Beekman Street, New York. This material will support any sized dog without sagging, and will cause no soreness of the feet.

FIG 1

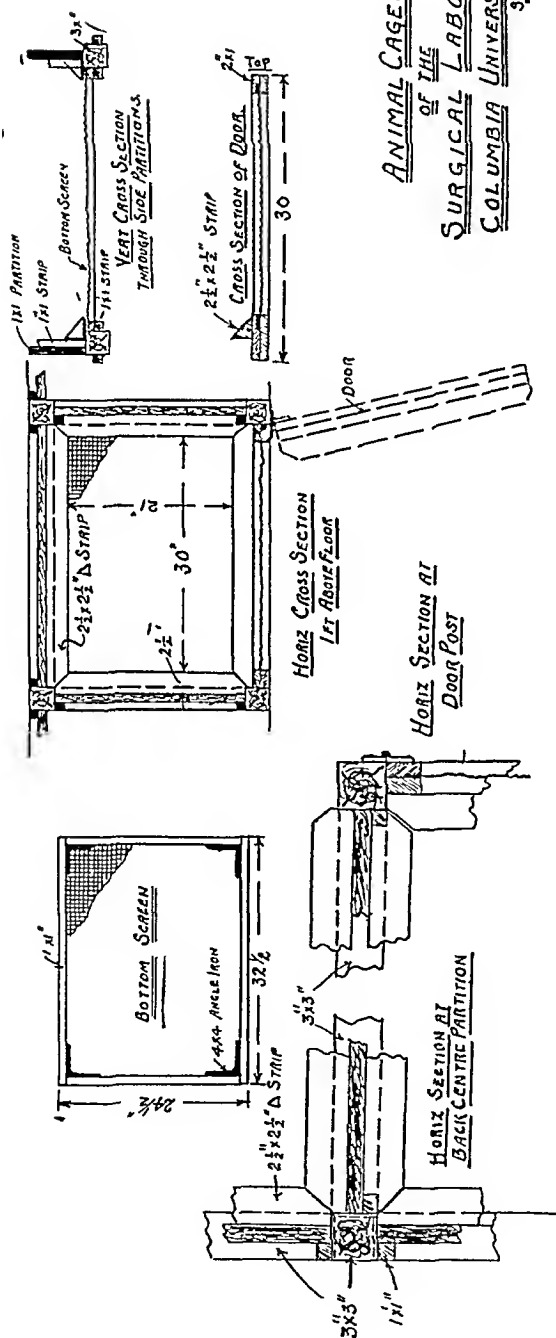
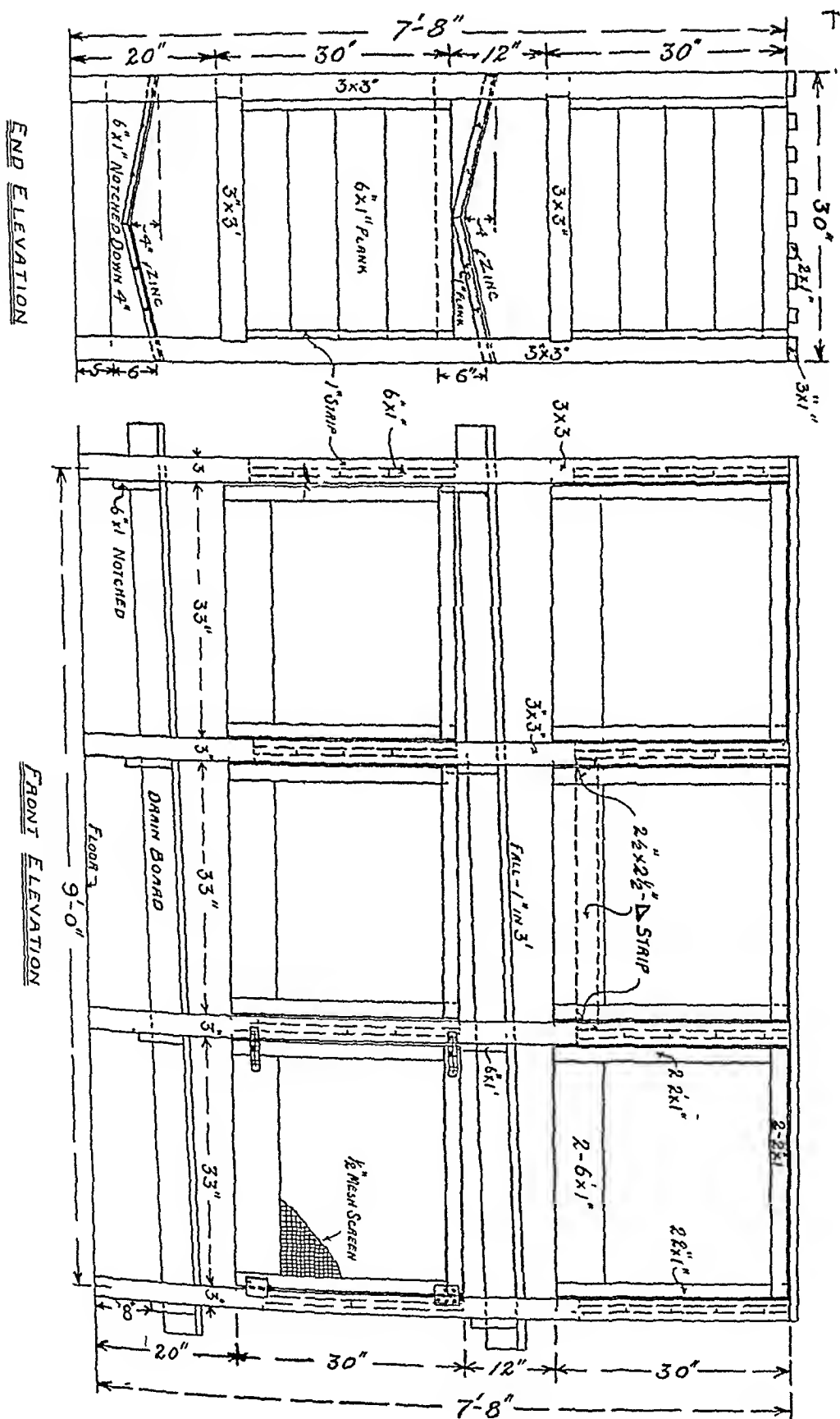


FIG 2



The drain-boards are to be flushed with a sprinkler connected with an automatic time flush tank, such as is used for ordinary urinals. This mechanism is not shown in the drawing, but it consists simply of two pipes running the length of each drain-board, perforated at frequent intervals by one-thirty-second-inch holes. These pipes, attached to the inner surfaces of the three by three-inch uprights, are jointed to the tank through a Y, and the overflow, suitably trapped, is connected with the soil-pipe.

Our cage is not yet fitted with the flushing apparatus, but one of us (Gordon) finds no difficulty in caring for its six occupants in addition to doing the regular second year student work.

The cage is lined on the inside with zinc to the height of eighteen inches. The lower edge of this is reflected inward and downward on the triangular strip running round the base of the compartment. This directs the excretions beyond the wooden frame of the floor screen. The zinc is carried up on the doors in the same manner.

The cost of such a series of six cages, exclusive of labor, is \$40 00.

We gratefully acknowledge our indebtedness to Mr. James F. Sanborn, of the Rapid Transit Engineer Corps, who kindly drew the finished working plans, and also to Mr. L. Casamajor, who photographed the cage.



FIG 3 —A sanitary animal cage for laboratory use

TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 27, 1904

GEORGE WOOLSEY, M D , in the Chair

RESECTION OF STOMACH FOR BENIGN PYLORIC OBSTRUCTION GASTRODUODENOSTOMY

DR WILLY MEYER presented a woman, fifty-three years old, upon whom operation was done by Dr Meyer ten years ago at the New York Post-Graduate Hospital. It was the first case in which he had employed the Murphy button, and one of the first cases in which the button had been used in this city. At the time of the operation the patient complained of gastric symptoms dating back four years, and her condition was such that a malignant growth of the stomach was suspected. Below the xiphoid cartilage there was a distinctly palpable tumor about the size of a small apple; it was freely movable. Upon exposing the stomach wall, two small additional tumors were recognized, and this strengthened the view that the case was malignant in character. Acting upon this supposition, a very free resection of the stomach was made. The wound in the stomach was closed with two rows of sutures in the usual way, and a posterior gastroduodenostomy with the Murphy button (end to side) completed the operation. This operation was done some time before Kocher had published his method. The button was passed on the twenty-first day, and the patient made an uninterrupted recovery. The supposed cancerous growth was submitted to a pathologist, who reported that there was no suspicion of carcinoma, and that the tumor was composed of scar tissue, evidently on the base of an old ulceration. The benign character of the growth was verified by the subsequent

history of the case The patient rapidly improved after the operation, and now, after ten years had elapsed, she was in perfect health and able to take and digest any kind of food The case nicely illustrates that such a lateral anastomosis, perfected with Murphy's button, does not contract, a fact well known to-day, but feared by many in the early time of using the device

OSTEOCHONDROMA OF THE HUMERUS

DR L A STIMSON presented a woman, fifty-nine years of age, who in September, 1903, complained of a painful swelling involving the upper part of the left arm The pain had existed about two years, the swelling coming on later and rapidly increasing during the past few months

Examination showed a well-defined swelling involving the upper posterior and inner aspect of the left humerus It was apparently an osteosarcoma, and the X-rays showed bony trabeculae traversing the growth in many directions The soft parts were freely movable above the tumor

As the case seemed a favorable one for the purpose, it was proposed that, instead of sacrificing the entire limb, the upper portion of the humerus should be resected This operation was done on September 22, 1903 In order to secure perfect access to the growth and insure its complete removal, it was approached posteriorly through a longitudinal incision, supplemented by a horizontal one close below the acromion The tumor was completely encapsulated and had pushed away the surrounding soft parts without invading them The humerus was divided some distance below the lower margin of the growth, the section of bone removed comprising all above the lower margin of the insertion of the pectoralis major The wound healed *per primam*, and the woman was discharged on the twelfth day

A microscopic examination of the growth showed that it was composed largely of cartilaginous tissue, that is, an osteochondroma, with some sarcomatous elements

The patient had since regained the free use of her arm She was able to take a daily horseback ride and could lift objects of considerable weight In fact, she could perform all movements excepting, of course, those that required a fulcrum at the shoulder-joint Sensation was somewhat impaired over a small area in the region of the acromion

In reply to a question as to whether he would be willing to repeat this conservative operation in dealing with tumors of a more malignant type, particularly sarcomata, Dr Stimson said that he had had the operation in mind for some years, but this was the first time he had had an opportunity to resort to it. He believed it was applicable to cases of similar growths at other points in the bone, but in no instance should the advantage of saving the limb be purchased at the cost of a greater probability of recurrence. From an investigation he made some years ago, he formed the opinion that a recurrence in these cases was much more commonly observed at a distance from the original lesion—in the lungs, brain, etc—than *in situ*.

DR ARTHUR L FISK said that in March, 1898, he read a paper before the Hospital Graduates' Club, in which he reported three cases of amputation at the shoulder for sarcoma of the humerus. One of these was an osteosarcoma of the shaft of the humerus, another was a primary melanotic sarcoma of the shaft also, and the third was a subperiosteal sarcoma of the shaft showing myxomatous degeneration. In reviewing the literature of sarcomata of the long bones at that time, the opinion of Butlin, Warren, Sutton, and others was that amputation in the continuity of the bone was not wise, because of the greater probability of recurrence. Dr Fisk said that in his three cases no recurrence *in situ* occurred.

DR GEORGE WOOLSEY mentioned two cases of sarcoma of the parts about the humerus, not originating from the bone, in which an interscapular-thoracic amputation was done. In one, a large ulcerating recurrent sarcoma, the operation proved fatal, and in the other there was a recurrence in the nerves of the brachial plexus. In that case the tumor had originated in the nerves of the upper arm and amputation did not prevent a prompt recurrence.

GASTRECTOMY FOR CANCER OF POSTERIOR WALL OF STOMACH

DR WILLY MEYER presented a woman, forty-four years old, who was admitted to the German Hospital on September 22, 1903. About a year before entering the hospital she first began to complain of distress and oppression in the region of the stomach, coming on shortly after eating. These symptoms could be relieved

by enforced vomiting For the past four or five months she had to restrict her diet, and had lost much in weight and strength She had had occasional attacks of vomiting, but the vomitus had never contained any coffee-ground-like matter Recently, her gastric pain had increased in severity, and always came on after eating

Upon admission to the hospital, the stomach contents were tested Before the Ewald test meal, no free hydrochloric nor lactic acid was present, after, hydrochloric acid equal 35, lactic acid again absent Microscopically, blood was found both before and after the meal On the day following her admission, she had a bloody stool, evidently from a hæmorrhage in the stomach

The case was regarded as one of gastric ulcer, and the patient was given nutritive enemata and rest Under this treatment there was apparent improvement, and feeding by the mouth was soon resumed Within a month after her admission she had gained five pounds in weight, and her general condition had improved so much that she returned to her home A month later, after a rather hearty dinner, she had an attack of gastric pain, and subsequently vomited a dark-brown fluid A few days later she had two similar attacks, vomiting coffee-ground-like matter

The patient was readmitted to the hospital on December 7, 1903, and a careful physical examination again gave negative results No definite tumor could be felt, although there was a sense of resistance in the epigastrium An examination of the stomach contents showed a trace of lactic acid and a diminished amount of free hydrochloric acid after a test meal The gain in weight made during the patient's previous stay in the hospital had been lost, and her gastric symptoms were worse

An exploratory operation was done on December 10, the stomach being exposed through a small median incision Its anterior wall was apparently normal, but on the posterior aspect of the stomach a tumor was felt, and there were many enlarged glands along the lesser and greater curvature Resection of the stomach was done, after primary ligation of the major and minor omentum, including the glands, by mass ligatures The removal of the stomach was very extensive, including more than the distal two-thirds of the lesser curvature, and at least as much of the greater curvature The stomach was not at all enlarged, and the section that was left next to the cardia, therefore, was extremely small After

closure of the stomach and duodenum the operation was completed by doing a posterior gastro-enterostomy by means of a Murphy button. No additional sutures. Had it not been for the two retention sutures, which had been left long, this part of the operation could not have been done, except by adding the osteoplastic operation on the costal arch, to be described farther on. The button was the only means of making the anastomosis. Suture as well as elastic ligature was out of question on account of the small portion of the stomach left and lack of room.

The wound closed by primary union, and since the operation the patient had gained steadily in weight and strength, in spite of the fact that perhaps only one-quarter of her stomach was left. The button was never found, although it was probably passed and overlooked in the stools, as the X-rays had failed to locate it in the body. The specimen shows a large, round, infiltrating carcinoma in the middle of the posterior wall of the stomach.

RESECTION OF STOMACH

DR WILLY MEYER presented a man, fifty-six years old. A year before admission he first began to have pain after eating his evening meal, the pain was accompanied by belching, but no vomiting. During the past five months the pain had become more severe and followed each meal, it persisted for a few hours and then disappeared. He had lost considerably in weight, and was markedly emaciated and anæmic.

An examination of the abdomen showed a mass in the left hypochondrium extending from below the border of the ribs downward and to the right to about the middle line, it was freely movable, not tender. Free hydrochloric acid was present both before and after a test meal, while lactic acid was entirely absent.

A resection of the stomach was done at the German Hospital on May 25, 1903, by Professor von Mikulicz, who was then visiting this country. After a preliminary extirpation of the umbilicus, the stomach was exposed through a median incision, and a movable tumor was found involving the pylorus and a considerable section of the adjacent stomach wall. After ligation of the major and lesser omentum, the stomach wall was clamped and resected at its proximal and distal extremities. The large stomach wound was then narrowed down by a continuous, convergently running

silk suture to a caliber corresponding to the cut surface of the duodenum, which was kept, unclamped, exposed to view upon a compress of aseptic gauze. End-to-end anastomosis was then done with Murphy's button. The operation illustrated Billroth's operation No. 1. The duration of the operation was less than fifty minutes. The patient made an uneventful recovery, and, the button being passed on the sixteenth day, was discharged from the hospital on June 20. Since then he had gained twenty-five pounds in weight, and thus far had shown no evidences of a recurrence. The pathologist reported that the growth removed was a carcinoma.

OSTEOPLASTIC GASTROTOMY FOR IMPERMEABLE CICATRICIAL STRICTURE OF THE ŒSOPHAGUS

DR. WILLY MEYER presented a boy, fourteen years old, who in February, 1896, swallowed a large quantity of caustic lye by mistake. This produced a stricture of the œsophagus, and the following April he was admitted to Mount Sinai Hospital, where Dr. Gerster performed gastrotomy and divided the stricture by Abbe's string method at the same sitting with such good success that the boy was soon again able to take food by way of the mouth. At the end of a year, however, the stricture had reformed, when the late Dr. Van Arsdale established a permanent gastric fistula according to Witzel's method. For the following eight years the boy was fed entirely through his gastrotomy wound. In September, 1903, the patient was admitted to the German Hospital, where it was found impossible to introduce any instrument into the stomach from above. In order to facilitate this procedure, Dr. Torek established an œsophageal lip-fistula.

When Dr. Meyer first saw the patient on September 21, 1903, it was impossible to pass even a filiform bougie into the stomach. At various times the cystoscope was introduced into the stomach through the gastrotomy wound, and attempts were made to locate the cardia, but without success. Kelly's cystoscopic tube was then introduced through the wound in the œsophagus, and this revealed a minute opening at the upper end of the stricture, closely resembling in appearance a cervix uteri. Through this small aperture a fine probe entered for a distance of about half an inch. Repeated attempts were made to distend it with fine laminaria tents, and in the course of six or eight weeks he succeeded in pushing down



Present condition of boy after osteoplastic gastrotomy

without much force a straight metal probe,—flexible being quickly arrested,—which, when measured after withdrawal on the outside of the chest, should have entered the stomach. Its tip, however, could not be detected in the stomach by means of sounds or the cystoscope, and it was therefore concluded that it must have entered a false passage.

In order to gain better access to the stomach, an osteoplastic gastrotomy, according to Marwedel, was done by Dr Meyer on December 21, 1903. A U-shaped incision was made, its inner part crossing the cartilages of the ribs, its outer corresponding to the attachments of the cartilages and bones. (See Fig.) The seventh cartilage was then divided in the median line near the sternum, and the ninth and tenth near their union with the rib. This flap was then turned upward, and gave a good view of the upper portion of the stomach, which was very small. In order to avoid soiling the peritoneal cavity, the patient was placed in a pronounced Trendelenburg posture, and the entire subphrenic space around the stomach was carefully packed with aseptic gauze and large gauze sponges. Two silk ligatures were then introduced and the stomach pulled into the wound on the outer side of the gastric fistula, the position of the fistula remaining undisturbed. An incision of about two inches was then made in the stomach, the latter unfolded with sponges on a handle, and a small electric light introduced, such as was employed in operations on the bladder. A careful search was then made for the cardiac orifice, but it could not be found. An irregular-shaped opening was discovered to the left of the fundus, through which a probe could be introduced for a short distance only, at that point it became completely obstructed, and was apparently a false passage, perhaps made by the probe that had been previously introduced from above. After a long search the stomach was temporarily packed, the patient was lowered, and a metal probe introduced from above by means of the Kelly cystoscope. The patient was then again raised, and with the finger in the stomach the lower end of the probe was searched for, but it could not be felt. Evidently, its lower end was in a false passage above the diaphragm. A stout, slender, dressing forceps was then pushed forcibly upward at the point which had been regarded as the probable cardiac orifice, cicatricially closed, and gently pressed upward for a distance of from two to four inches and was then opened. Through this artificial opening air was

audibly sucked in with each respiration. Various instruments were then pushed up through this opening, but all of them became obstructed at the same point. A curved director was also introduced from below, but its point failed to meet the probe passed from above. Further attempts were thereupon abandoned. The new incision in the stomach was closed with a double row of silk sutures, and the osteoplastic flap fitted back in its former place, the skin being sutured without drainage. Recovery followed. Feeding by the gastric fistula was begun on the third day. At present the patient is gaining about one-half pound every week. Dr Meyer said that by raising the osteoplastic flaps he gained beautiful access to the cardia and the diaphragm. As soon as the patient has recovered from the operation, he intends to again raise the chest-flaps, open the stomach close to the cardia, and follow up the blind canal, mentioned above, incising the gastric wall on a grooved director with Paquelin's cautery from within. He still hopes to be able to push a thread through the oesophagus.

DR GEORGE WOOLSEY referred to the effect of posterior adhesions in cancer of the stomach on the question of radical operation. In a case where he operated last summer, in which a cancerous growth was suspected but could not be felt he found that the posterior gastric wall was firmly adherent to the pancreas, and this deterred him from doing a radical operation, as it was a question in his mind whether the result justified it. Von Mikulicz, in his article on the surgery of the pancreas read before the last Congress at Washington, speaks of the large mortality of operations for gastric cancer (70 per cent), in which posterior adhesions or enlarged lymph nodes involved the pancreas in the operation, as compared with a mortality of 27.5 per cent in simple cases of resection of the stomach.

GUNSHOT WOUND OF THE ABDOMEN, WITH PERFORATION OF THE STOMACH

DR GEORGE E BREWER presented a negro, aged twenty-one years, who was admitted to the Roosevelt Hospital at midnight on November 8, suffering from a gunshot wound of the abdomen, presumably self-inflicted.

On admission, he presented the evidences of considerable shock, pulse, 104, temperature, 96.4° F. On examination, the

abdomen was somewhat distended, slight tenderness and rigidity over the upper half. About two inches to the right and one inch above the umbilicus there was a small bullet wound through which a probe was easily passed into the abdominal cavity. He was immediately prepared for operation.

Under ether anæsthesia, an incision was made in the median line, extending from a point one inch below the ensiform cartilage to a point two inches below the umbilicus. On opening the peritoneal cavity, there was found a quantity of free fluid and clotted blood. A hasty examination revealed the origin of the blood to be from the neighborhood of the stomach. On freely exposing this organ, an oval, ragged wound was found near the pylorus, through which protruded folds of mucous membrane, which served as a plug, preventing the extravasation of any considerable amount of the contained fluid. The bleeding was found to issue largely from the wounded branch of the pyloric artery.

The wound in the stomach was rapidly united by two layers of Lembert sutures. A search was then made for the wound of exit. The entire anterior surface of the stomach was carefully explored, also the posterior wall, through an opening made in the transverse mesocolon. No wound of exit was found, and careful palpation of the stomach revealed no trace of the bullet within its cavity. The intestine was then examined from the duodeno-jejunal junction to the rectum, and no further wound discovered. Careful examination of the other viscera and the abdominal parietes failed to reveal the presence of a wound or any mark indicating the course of the bullet.

The entire abdominal cavity was then douched with a large quantity of sterile salt solution and the abdominal wall closed with two cigarette drains. The patient made an uneventful recovery.

DR STIMSON said he thought it was not uncommon to have a bullet perforate a hollow viscus without emerging from it. The speaker said he had seen two or three instances of this.

UMBILICAL HERNIA

DR JOSEPH A. BLAKE presented a woman, thirty-nine years of age, who was operated upon by him, January 25, 1902, for umbilical hernia associated with diastasis of the recti abdominales, following multiple pregnancies. The patient weighed 212 pounds,

the abdomen was pendulous, the separation of the recti before operation was apparently six inches, although at the operation it was found to be only two and one-half inches. The hernial sac was three inches in diameter, its neck one inch, and its contents adherent.

The operation consisted in the excision of a vertical ellipse of skin and fat twelve inches long and six inches wide, the incision of the linea alba for the same distance, the excision of most of the sac, and the overlapping of the muscula and aponeurotic portions of the abdominal wall for a distance of three and one-half inches.

Dr. Blake presented a second patient, aged thirty-six years, who was operated upon February 1, 1901, for umbilical and ventral hernia of two years' standing, recurring after an operation five years previously for umbilical hernia.

At the operation the sac was found to measure six inches vertically by five inches transversely, while its neck was two inches wide and four inches long, the recti abdominales were separated two inches. The contents of the sac were adherent, and the linea alba consisted, practically, of scar tissue only.

An ellipse of skin and fat twelve by four inches was excised, the linea alba slit for three inches in addition to the hernial opening, and the aponeurotic tissue and muscles lapped two inches with great tension, inasmuch as the muscles had regained their tone and shortened on account of the size of the protrusion.

A third patient was also presented, aged thirty-two years, who was operated upon October 21, 1902, for umbilical hernia with diastasis of the recti of two years' standing.

The sac measured three inches in diameter, the ring one inch, its contents were irreducible omentum. The recti were separated two inches.

The operation consisted in the excision of a vertical ellipse of skin and fat ten inches long by four wide, and the overlapping of the muscular and aponeurotic tissues for a distance of two inches.

These cases were selected at random from a number that he had operated upon by this method during the last four years.

Two of them were primary operations, and there has been no relapse. One of them had had a previous operation and the

overlapping was difficult and unsatisfactory. She has a small relapse at the middle of the wound.

They all express themselves as relieved of their symptoms.

DR CHARLES N DOWD said that since Dr Blake had described his method of treating these cases of umbilical hernia, he had resorted to it twice with excellent results. Both cases were women of rather advanced age, the herniæ were of considerable size, and in both very firm apposition of the abdominal walls was secured. In one of the cases a year had elapsed since the operation, and in the other only three or four months. Thus far there were no evidences of a recurrence.

DR BREWER said he had followed Dr Blake's method in six cases. The last patient was a woman of enormous size, weighing over 300 pounds. In that case a seventeen-inch incision was necessary, and after cutting away all the thin, cicatricial tissue, such a large space was left that it required a great deal of strength to overlap the two sections of the abdominal wall. The operation was followed by temporary dyspnoea, probably the result of pressure, but this gradually disappeared. The patient was kept under observation for several months, and when she was last seen there were no signs of a recurrence.

DR STIMSON said he supposed the condition demanding operation in these cases was a diastasis of the abdominal muscles rather than the hernia itself. The speaker said that in a few cases during the past winter he had employed a method suggested by some one whose name he could not recall. It consisted in closing the hernial orifice by a transverse line of union, which would not be so exposed as a longitudinal one to separation by the pull of the lateral muscles.

DR CHARLES H PECK said he had employed Dr Blake's method in one case of umbilical hernia, with considerable separation of the recti, with excellent result. It was still too recent, however, to speak of the ultimate result in that case.

DR WOOLSEY said he had also found the overlapping method useful in all cases of ventral hernia, whether in the median line or elsewhere in the abdomen. Of course, it was not always possible to overlap the muscular layers much. For several years it had been his practice to modify the Bassini method for inguinal hernia by overlapping the aponeurosis of the external oblique.

DR BLAKE said he preferred the method of perpendicular, *ie*, from below upward, overlapping of the abdominal muscles in cases of umbilical hernia without much diastasis, in the other class of cases, in which the hernia was accompanied with marked separation of the muscles, he thought the transverse, *ie*, side to side, operation was better. The typical Mayo operation consisted of the perpendicular overlapping. One objection to the transverse method was that it sometimes required much strain to overlap the muscles, and was apt to interfere with the patient's respiration. On the other hand, it was of the greatest benefit in those cases in which the abdominal walls were lax, particularly when associated with enteroptosis.

SOME OBSERVATIONS ON THE EFFECTS PRODUCED ON THE SKIN BY THE DISCHARGE OF SMALL-ARMS LOADED WITH SMOKELESS POWDER

DR ALEXANDER B JOHNSON read a paper with the above title, for which see page 798.

DR BLAKE said that in an explosion of gunpowder, the active principle, composed largely of nitrites, was burned up and dissipated as gas, while the non-active constituents, such as saw-dust, etc., composed the residue. The speaker said that in the early days of smokeless powder he had noticed that after a discharge against the wind some of the residue was blown back into the marksman's face, but that since the old wood powder had been superseded by the improved nitro powders, this was not noticeable. Consequently, it seemed to him that a relative estimation of the powder staining by different brands might be of value from a medicolegal stand-point.

DR FISK said that in June last he saw in consultation a patient who had been shot accidentally in the left shoulder. The pistol, which was of 32-caliber, was discharged at close range, the distance was probably not more than three feet. There was not the faintest trace of powder marks or smudge upon the skin. The bullet entered the shoulder directly over the head of the humerus, passed inward and backward through the head of the bone, making a perfectly clean hole without the slightest splintering of the bone. There was no wound of exit. An incision was made on the posterior surface of the shoulder, the fibres of the muscles were carefully separated and retracted until the capsule

of the joint was reached, through which it was possible to feel the point of a director which had been passed along the track of the bullet through the head of the bone. Directly beneath this was felt the bullet. An incision through the capsule readily exposed the bullet, which was easily extracted by forceps. The incisions, both front and back, were sutured, excepting where small drainage wicks were inserted. Convalescence was without moment, and perfect functional use of the joint was obtained.

Stated Meeting, February 10, 1904

The Vice-President, GEORGE WOOLSEY, M D, in the Chair

HYPOSPADIAS, PLASTIC OPERATION

DR B FARQUHAR CURTIS presented a boy of ten years, who, when he was first seen by Dr Curtis, six years ago, had almost a complete hypospadias of the scrotal type, the opening of the meatus being at the posterior edge of the scrotum. The penis was bent and of minute size, and, in order to give it a chance to develop, the primary operation consisted simply of cutting it loose from the scrotum with suture of the wound. When the boy was again seen, six years later, he had a fairly well-developed penis, and on September 8, 1903, the hypospadias was operated on by the Szymanowsky method. The operation was done at two sittings, the first forming the membranous and glandular portions of the urethra. After the first operation the old meatus was left open and the bladder drained through it. The second operation was done to close the old meatus by a small flap. Drainage of the bladder was maintained by a catheter in a perineal boutonnière at the second operation. At the junction of the two flaps a small fistula remained, and in order to close it several applications of caustic were necessary. All the wounds have now healed.

A second patient was also shown by Dr Curtis, a boy of twelve years, in whom there had been a hypospadias of the penile

type The Szymanowsky method was followed, and the result, as in the first case, was excellent The first operation was done on September 5, 1903, when he succeeded in making a good bridge across the glans and part of the penile portion, but there remained a gap between the edge of the flap and the former meatus This defect was closed about a month later, the tissue being obtained from the redundant dorsal foreskin The foreskin was button-holed at its base and the glans thrust through the opening and the skin sutured to the edges of the gap Sutures had to be applied several times, and finally he secured complete union with the exception of some pinhole openings, which contracted after cauterization Perineal drainage by catheter was established for the first two operations

Dr Curtis said the chief difficulties he had met with in doing this operation were not with the flaps, but in closing the old meatus or gaps left between two flaps He called attention to the necessity for perineal drainage by catheter in order to get a good result He regarded this method as superior to drainage by catheter through the urethra, and there was less danger of infection than when the use of the catheter was omitted altogether He admitted that the use of the perineal catheter was not a perfect method of drainage, as it did not prevent the leakage of urine, but it gave better results than any other method in his experience In adults, where more careful attention to cleanliness could be expected, the use of the catheter could perhaps be dispensed with

DR CURTIS, in reply to a question as to what age limit he would establish in doing this operation, said he had never operated much under ten years, certainly not under eight The preliminary operation of freeing the penis, however, should be done as early as possible, so as to give that organ an opportunity to develop He did not think it worth while to operate at a very early age for the relief of the hypospadias itself

DR WOOLSEY reported a case of complete hypospadias in a ranchman from Colorado who was over fifty years old, and who had concealed his deformity up to that age The Szymanowsky operation was done in this case, which illustrated the difficulty in connecting the perineal opening with the posterior end of the new-formed urethra This seemed to be due to the insufficient caliber of the new-formed urethra, causing pressure at the point

of union. Hence an Otis urethrotome was finally introduced, and, after dividing the newly-formed urethra as if strictured and the subsequent use of sounds, the union of the newly-formed urethra and the anterior end of the original urethra in the perineum was successful

BENIGN TUMOR OF THE PYLORUS, GASTRO-ENTEROSTOMY

DR F KAMMERER presented a woman, about fifty years old, who came under his observation almost two years ago with the diagnosis of cancer of the pylorus. A distinct, movable tumor could be felt at the site of the pylorus, and the examination of the gastric contents seemed to point towards malignant disease. The woman had lost much in flesh and strength, and at the time of the operation she weighed 105 pounds. Upon opening the abdomen he found a hard, nodular tumor involving the pylorus. It was freely movable, but the patient's condition was such that the removal of the growth was deemed inadvisable. A simple posterior gastro-enterostomy was done with the Murphy button, according to the Carle and Fantino method. No Lembert sutures were used, and an additional entero-enterostomy was not considered necessary. The patient made an uneventful recovery from the operation. The button was passed on fourteenth day. Since then she had remained in excellent health and gained over fifty pounds in weight, thus proving that the pyloric tumor was of benign origin. The growth itself had apparently disappeared. The patient had never suffered from symptoms of regurgitation since the operation.

Dr Kammerer said his main reason in showing this case was that it again gave him an opportunity to advocate the superiority of posterior gastro-enterostomy by the Carle-Fantino method. He had never seen this operation followed by any symptoms of regurgitation, although an additional entero-enterostomy had never been done. In only one of his cases did the button fall back into the stomach. He believed the method was the quickest way yet devised for the performance of posterior gastro-enterostomy. He thought that the presence of the button might have something to do with the prevention of regurgitation, as it did not allow the formation of a spur at the site of the anastomosis.

POSTERIOR GASTRO-ENTEROSTOMY

DR ALEXANDER B JOHNSON presented a man, thirty-one years old, who came under his observation last September, complaining of gastric symptoms which dated back to the previous November. He had a fixed and more or less continuous pain located to the right of the middle line, and representing fairly well the location of the pyloric end of the stomach. In addition to the pain, he had daily attacks of vomiting, the vomitus consisting principally of food, he had never vomited any blood. As a result of his illness, his nutrition had suffered greatly, and when he came to the hospital he was much emaciated, weighing only about ninety pounds. A blood examination made at that time showed about 40 per cent of hæmoglobin.

Upon opening the abdomen, the pyloric end of the stomach and the first portion of the duodenum were found surrounded by and embedded in organized adhesions, evidently the result of a preceding localized peritonitis. These adhesions had produced quite a sharp kink at the junction of the pylorus and stomach.

On account of the presence of the dense adhesions, Dr Johnson said he concluded to do a posterior gastro-enterostomy. The stomach was pulled down to the slit in the transverse mesocolon and fastened there. A Murphy button of medium size was then inserted into the jejunum and an anastomosis made, perhaps eight inches from the end of the loop, into which finally a larger button was inserted, the other half being inserted into the stomach wall.

With the exception of one or two attacks of vomiting after the operation, the patient made an uneventful recovery. The smaller button was passed soon after the operation, and the larger one on the fifty-third day. The patient's weight had increased over forty pounds, and he had no symptoms at all referable to the stomach.

ILEOCÆCAL RESECTION FOR TUBERCULOSIS

DR KAMMERER presented a man, twenty-nine years old, who came to the German Hospital last December with the symptoms of gradually increasing stenosis of the intestine during the preceding eighteen months. Every day he had typical paroxysms, about half a dozen in number, during which peristaltic movements were visible on the abdominal wall. In the ileocæcal region

a fairly movable tumor could be made out. A physical examination of the chest showed involvement of the right lung, and tubercle bacilli were found in the sputum. The patient was greatly emaciated.

December 21, 1903, the abdomen was opened, a six-inch incision being made to the outside of the semilunar line, somewhat similar to McBurney's incision for suppurative appendicitis. A typical tubercular tumor involving the ileocæcal region was found, and, in resecting the gut, Dr. Kammerer said he followed the method that he had observed last summer in Koerte's clinic in Berlin. He first incised the peritoneum lining the outside of the mesentery, and then, after clamping the intestine and raising it within the abdominal cavity, he tied off the mesentery with a number of sutures, finally cutting through the intestinal wall. He then implanted the end of the ileum into the transverse colon with Murphy's button. The excised portion of the gut included nine inches of the ileum and the entire ascending colon, excepting one and one-half inches at the hepatic flexure. The intestines in the region operated on were the seat of a miliary eruption, which on the ileum extended beyond the point at which the latter had been divided. The speaker said he followed Koerte's plan of closing the wound entirely, and making a counter-opening above the ileum, into which a drainage tube and small piece of gauze were inserted. The tube was removed in forty-eight hours and the gauze three or four days later. The wound healed by first intention and the counter-opening closed in two weeks.

Since the operation the patient had gained slightly in weight and had been free from all intestinal symptoms.

FRACTURE OF THE CLAVICLE, WITH RUPTURE OF THE AXILLARY ARTERY AND THE BRACHIAL PLEXUS, AMPUTATION AT THE SHOULDER, RECOVERY

DR. ARTHUR L. FISK presented a lad of seventeen years, a plumber's helper, who on December 17, 1904, was assisting in hoisting heavy iron sewer-pipe from the second to the seventh story of a building which was in the process of construction, when a length of the pipe fell from the seventh story, striking him upon the left shoulder. He was rendered unconscious for some hours from the blow, an ambulance carried him to one of the large hospitals, where he was treated for a simple fracture

of the clavicle Late in the evening he was transferred to Trinity Hospital, when seen there, he was still in a condition of shock, the left arm was confined by a Sayre's bandage for fracture of the clavicle The hand and arm were so swollen, and there was so much swelling over the clavicle, that Dr Kenyon, who saw the case, considered that it was best to remove the adhesive straps and to confine the arm simply by a lightly applied Velpeau bandage On the following day, Dr Fisk found upon examination extensive ecchymosis and swelling over the supraclavicular region There was no pulsation in this swelling It was impossible to define the outlines of the clavicle except at the acromial end, the middle portion of the clavicle appeared to have been driven downward, inward, and backward There was a complete sensory and motor paralysis of the hand and forearm, and complete motor paralysis of the arms, but sensation existed in the skin throughout the upper portion of the arm, though somewhat diminished, especially posteriorly The hand and forearm were œdematous, the color slightly cyanotic, especially in the nails, however, the circulation seemed to be fair No pulsation could be detected in either the radial or the brachial arteries The left pupil was contracted and did not respond to light There was slight aphonia, and a great deal of pain in the forearm Pressure over the site of the clavicle caused pain, which was referred to the fingers The diagnosis of fracture of the clavicle with probable rupture of the axillary artery, and either rupture or severe contusion of the brachial plexus, was made The serious nature of the injury was explained to the patient, also the surgical measures which would in all probability be necessary He requested to be permitted to confer with his relatives before giving his consent The treatment instituted was to swathe the limb in cotton, then bandage it, and elevate it upon pillows A hard pillow was placed beneath the middle of the back in order to permit the shoulder to fall backward, in which position the circulation in the hand and arm improved decidedly, the cyanosis disappearing entirely, even in the finger-nails, which suggested that the symptoms were due possibly to compression of the artery and nerves against the rib, and not to rupture of them On December 18 the tip of the little finger showed evidence of dry gangrene, so that longer delay was considered inadvisable On December 19 an incision was made along the

posterior border of the sternomastoid muscle down to the clavicle, then outward to the acromioclavicular articulation, thus the supraclavicular fossa was opened. The tissues were so contused that it was difficult to recognize the different structures. The clavicle was not depressed, in fact, it seemed to be intact, but in passing the finger along the lower surface a false point of motion was discovered, it was a subperiosteal fracture. This was made a complete fracture, the two ends of the bone were then drawn outward and downward. The axillary artery was found completely torn through at the edges of the first rib. It pulsated distinctly, but there was no hæmorrhage from it. What at first sight appeared to be the distal portion of the artery proved to be the distal ends of the brachial plexus very much contused and swollen. The artery was ligated in its second portion. The proximal ends of four of the roots of the brachial plexus were found between the scaleni muscles, these were refreshed, also the distal ends, and the two ends then united by fine catgut. The clavicle was drilled and the ends united by chromicized catgut, and the wound closed. The boy stood the operation well. On December 23 his temperature rose to 104° F, the ulnar surface of the hand and forearm became gangrenous, so that on December 24 amputation at the shoulder-joint was done. Convalescence from this time forth was uninterrupted.

DR WOOLSEY said he had at present under observation at Bellevue Hospital a patient who had a complete rupture of the brachial plexus without fracture of the clavicle. This was the second case he had seen within two years. In the first case, which was operated on by Dr A J McCosh, a cord-like mass was found occupying the usual location of the brachial plexus, and nothing could be done in the way of treatment. In one of the cases the injury was produced by a fall from a bicycle, in the other by a fall from a freight-car. In neither case was the clavicle fractured.

DR CURTIS thought the most remarkable feature of Dr Fisk's case was the spontaneous cessation of hæmorrhage after the rupture of such a large artery as the subclavian.

DR FISK said he could not explain that feature of the case. He had expected to find a large blood-clot, but simply found a contused condition of the muscles and fascia. The force of the blow was evidently so great that the coats of the artery had been crushed through completely, thus allowing the inner coats to

retract and occlude the lumen of the vessel, thus preventing any hæmorrhage

In injuries of the limbs, especially railroad traumatism, where the tissues were crushed off rather than cut off, similar conditions had been observed. It is the principle of the angiotribe

RUPTURE OF THE URETHRA

DR JOHN A HARTWELL presented a man, twenty-six years old, who was admitted to the Lincoln Hospital on June 28, 1903, with the history that an hour previous to his admission, while at work in the subway, he was struck in the region of the right hip and thigh by a heavy dirt-bucket, which knocked him down. On admission he was in a condition of mild shock, and an examination showed copious bleeding from the urethra. A catheter easily entered the bladder and drew off several ounces of blood and urine. Eight ounces of normal saline solution were then injected into the bladder, and the entire quantity was returned with bloody discoloration. From that time on he had no trouble with micturition. External evidence of the injury was limited to an ecchymosis in the perineum. The hæmaturia ceased entirely after twenty-four hours.

Upon admission, the patient's temperature was 100° F, pulse, 100, respirations, 24. During the following five days the temperature gradually rose to 103.5° F, with a moderate intermission each day, but a steady rise over that of the preceding day. He showed a typical typhoid condition, and the Board of Health reported a positive Widal reaction with a 1 to 20 blood dilution.

During these five days, all the symptoms referable to the urinary apparatus had subsided, and there was no evidence of any urinary extravasation or collection of pus, though such a condition was suspected, and repeated examinations were made with this possibility in mind. On the seventh day, however, he for the first time complained of pain on deep perineal pressure and on pressure into the pelvis above Poupart's ligament on the right side. He was anæsthetized and an incision made at the latter point, where deep palpation seemed to show a fluid collection. A hæmatoma occupying the iliac fossa was evacuated. A half-inch rent was found in the bladder, just above the neck, and a second one through the posterior layer of the triangular liga-

ment and the membranous urethra. No evidence of pelvic fracture could be found. External urethrotomy was performed and the bladder drained in this way, while the cavity of the hæmatoma was drained from above. No sutures were used either in the bladder rent nor in the urethral tear.

The man's temperature ran a septic course for some weeks and then became normal, and in about eight weeks the wounds had healed and urination was completely normal.

About three weeks after the injury he first complained of pain in the left hip, and there was restricted motion in this joint. On his discharge, this condition persisted, and he had a decided limp. He returned to the hospital four months later, complaining of pain in the hæmatoma cavity, and a small discharging sinus was found at the site of the primary incision. This was opened and explored. No bone involvement was found and the sinus promptly healed. Urination to-day is normal and the urethra admits a No 28 French sound with little difficulty. There is decided limitation of motion in the hip-joint, together with two inches' atrophy of the thigh muscles and one inch shortening of the extremity. There is no spontaneous pain excepting at night, but passive and active movements cause pain. He walks with the characteristic limp of hip-joint disease. The temperature remains normal.

DR JOHNSON said that some years ago, at Roosevelt Hospital, he had a case almost identical to the one shown by Dr Hartwell. The patient returned to the hospital a year after the original injury with a necrosis of the descending ramus of the pubes and the ascending ramus of the ischium. The speaker said it had occurred to him that possibly some bone infection or inflammation had taken place in Dr Hartwell's case.

DR HARTWELL said that when the man returned to the hospital with a discharging sinus four months after the receipt of his injury, the presence of dead bone was suspected, but none was found after a very careful examination.

THE RADICAL CURE OF FEMORAL HERNIA

DR FRED KAMMERER read a paper with the above title, for which see page 982.

DR CURTIS said that his experience with the treatment of femoral hernia had been limited to the purse-string method.

Among eighteen cases, he had been able to follow only three or four for some years, and in these there had been no recurrence. In one of them there had been no recurrence after ten years, and another went through a subsequent pregnancy without a recurrence.

In cases where the hernia was a large one, with a good-sized femoral ring, the speaker thought it was generally quite easy to retract the edges of the opening, so as to introduce the first purse-string suture well inside and get a flush internal opening. The weakness of the purse-string method was in the direction of the vein, and when the femoral opening was small and the parts rigid the method was very unsatisfactory. Under those conditions the tightening of the suture did not bring the upper parts firmly in contact with the pectineus muscle, and he recalled two or three such cases where the prospect of a recurrence seemed very likely.

In operations for femoral hernia, the treatment of the sac was very important. The speaker said that in his earlier cases he pressed up and reflected the sac well up above the femoral ring by a suture passed as in McEwen's method, but more recently he had adopted Kocher's method of dragging the stump of the sac through the abdominal wall well up above the level of Poupart's ligament. In two or three instances where the hernia was strangulated he had been obliged to divide Poupart's ligament ("herniolaparotomy"), but he always hesitated to resort to this procedure, as it seemed to weaken the strongest bulwark against abdominal pressure. He did not regard the routine division of Poupart's ligament as a sound surgical procedure. Ordinarily, femoral hernia was a very easy condition to cure, and he considered simple methods preferable to complicated ones.

DR OTTO G T KILIANI said the weakness of the Lotheissen method in the direction of the vein, to which Dr Curtis had referred, was overcome by the Fabricius method, but the latter could not be employed in cases where there was a large femoral ring.

DR KAMMERER said he had found it very easy, after exposing the femoral vein, to pull it aside with the aid of a blunt retractor, and then insert the suture. The muscle could be pulled down towards Cooper's ligament as far as it was deemed necessary.

The speaker said he only advised division of Poupart's ligament in cases where the hernia was strangulated. He was aware that femoral hernia could generally be cured by simple ligation of the sac and skin suture, but there were certain cases in which recurrences took place, and he thought that the method of operation should be chosen which promised to give the most certain result.

DR CURTIS said he thought the weak spot in these cases would always be in the direction of the vein, and this was not remedied by suturing Poupart's ligament to the pectineus fascia.

URETER IN AN INGUINAL HERNIA

DR HARTWELL exhibited a specimen of a hydronephrosis with ureter attached, stating that the patient from whom the specimen was removed was a man, sixty-two years old, who was operated on by Dr. Hartwell in January, 1898, for a right inguinal hernia, which had existed for several years and had been irreducible for one year. The hernial tumor was very large, measuring eight by five inches when the patient was in the recumbent posture. When the patient was in the upright position, the bottom of the scrotum reached to the middle of the thigh, rendering locomotion almost impossible.

An incision about six inches long was made over the inguinal canal and down over the scrotal tumor, dividing the skin and fasciæ down to the sac. The tissues were then separated from this without trouble anteriorly and on the lateral aspects, but posteriorly the adhesions were very firm and the intestine was uncovered by peritoneum, the colon and cæcum making the sac wall in this part. The hernial contents were the cæcum, the appendix, a foot of the colon, and ten inches of small intestine. Lying behind and outside the hernia proper, but inside the scrotum, was a round, firm cord, in which a lumen could be made out. It was half an inch in diameter, and the portion in the scrotum was about six inches long. It lay in the shape of a loop, with the convexity downward, and the two ends passing behind the neck of the hernia into the pelvis. Its course could not be traced beyond this point, and its nature was uncertain, a prolapsed ureter and a dilated vein being considered possibilities.

On account of the dense adhesions, the hernial operation took a long time, and upon its completion the loop of cord men-

tioned was pushed up behind the peritoneum and left there. The patient's condition was fair at the end of the operation, and he apparently reacted well. At the end of twelve hours, however, he began to fail rapidly, and died a few hours later, the cause of death being the shock from the prolonged handling of such a mass of intestine, and the intolerance of the abdominal cavity for it when it was returned.

At the autopsy, the unidentified cord proved to be a ureter prolapsed in a loop into the scrotum behind the peritoneum,—probably pulled there by the colon in its descent, the hernia being of the so-called “gliding” variety. The kidney from which this ureter descended was found to be the seat of a large hydronephrosis, the position of the ureter acting as an obstruction to the outflow of urine. This obstruction was probably intermittent, because on straightening the ureter the urine flowed freely into the bladder.

Dr Hartwell said that the only similar case he could find on record was reported by von Bergmann in his surgery.

NEPHRECTOMY FOR RENAL CALCULI

DR CHARLES H. PECK presented specimens removed from a girl, seventeen years old, who was admitted to Roosevelt Hospital on February 1, 1904, with the following history. Family and previous personal history unimportant, no history of scarlet fever. Present illness, three months ago had a slight attack of pain on right side, lasting about a week, varying in severity, sometimes shooting into the groin, down the thigh or across the small of the back, she was then free from trouble until two weeks ago, when the pain returned. It began suddenly, growing gradually worse, and for two days it was so severe as to prevent sleep, it then disappeared and returned a week ago, and has continued remittent ever since. During the attacks of pain she has increased frequency of micturition, four or five times at night, and oftener during the day, with some pain. Urine has never been bloody. Patient has to support the right side on standing and cannot lie on left side, as it causes pain. No fever nor sweating. Has never been confined to bed by pain, has lost six or eight pounds in weight during the last six months. Upon admission, the temperature was 99.4° F, respirations, 24, pulse, 116. Urine, turbid,

specific gravity, 1014, markedly alkaline, no sugar, considerable pus and triple phosphate

Examination showed a sensitive mass in right lumbar region, apparently the right kidney, somewhat low in position but not much enlarged. It was distinctly tender on palpation. An attempt to catheterize the ureters under local anæsthesia failed on account of the hyperæsthetic condition of the patient. X-ray photographs show what were apparently four stones in the right kidney. Two plates were taken, with exposures of seven seconds and fourteen seconds, respectively, both showing the four shadows distinctly.

Operation, February 6, by Dr Robert F Weir. The kidney was somewhat adherent to the perirenal tissue. It was brought into the wound, covered with sterile gauze, and with a portable coil a fluoroscopic view of the stones was quickly obtained. As the kidney seemed atrophied, the cortex thinned, and the stones large, it was decided to remove it, and nephrectomy was performed.

DR L G COLE, who had taken the X-ray photographs and fluoroscopic pictures in the case reported by Dr Peck, called attention to the very short exposures of the two plates, one having been exposed only seven seconds and the other seventeen seconds, and both showed the shadows of the foreign bodies in the kidney very distinctly. He attributed the good results of the short exposures in this case to the use of the low vacuum tube, which he considered preferable to the use of a tube of high vacuum, especially in searching for stones in the kidney. He also spoke of the value of concentrating a large fluoroscopic picture upon a small plate in order to bring out the outlines more distinctly.

FOREIGN BODY IN THE BRONCHUS

DR OTTO G T KILIANI showed a scarf-pin which he had removed from the bronchus of a school-boy. The history of the case was as follows. On January 14, 1904, about six o'clock in the evening, the boy had found the scarf-pin on the floor. It belonged to one of his schoolmates, but in a spirit of fun he refused to give it up, and put it in his mouth, head first. The owner thereupon grasped the boy by the nose, this caused him to gasp, and the pin disappeared down his throat. Two hours later the accident was reported to the head-master of the school,

and the following morning the patient came to New York and was admitted to the German Hospital. During his journey he had several fits of coughing and raised some blood-stained mucus.

January 15 A laryngoscopic examination revealed the scarf-pin between the vocal cords and the trachea.

January 17 Pin could no longer be seen with the laryngoscope. Lungs and heart negative. X-ray photograph negative.

January 19 Dr Kiliani performed tracheotomy. As soon as the trachea was opened the patient had a violent fit of coughing and the point of the pin appeared in the wound, but disappeared again before it could be grasped. A few moments later the pin was again coughed into the opening and was seized and removed. A tracheotomy tube was inserted. This was removed two days later. There was slight suppuration, but the wound had closed entirely by January 30, and the patient was discharged cured.

DR KAMMERER said that less than a year ago he saw a child of five years who had aspirated a small metal horse. Laryngoscopic examination showed that the toy had become fixed between the vocal cords, with the hind feet above the entrance to the larynx. Under narcosis, an effort was made to extract the toy through the mouth, but this proved unsuccessful, it being so firmly caught between the vocal cords. Through a tracheal opening the head of the horse was then grasped, but it could not be delivered without fear of injuring the cords. The cricoid cartilage was thereupon split, but even then the toy could not be safely extracted, and it was not until the thyroid cartilage had been divided in the median line that it could be removed.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, February 1, 1904

The President, HENRY R. WHARTON, M D, in the Chair

FRACTURE OF THE PATELLA TREATED BY SUTURING

DR JOHN H. GIBBON exhibited three patients in whom suture of a fractured patella had been done, and reported the facts of a fourth similar case. These operations had been done during the past two and a half years.

So satisfactory have the results been in these cases, that he thought it worth while to present the patients for examination. An inspection of the patella and examination of the function of the knee-joint in each of these cases will show a practically normal condition, and he is convinced that certainly in these individual cases no such result could have been obtained by any other than the open treatment. Operation was resorted to either because of non-union after other forms of treatment, or because of the impossibility of thoroughly approximating the fragments by any other method. That there has been a firm, bony union which has withstood the ordinary avocations is easily demonstrated, and consequently he thinks that there is absolutely no danger of re-fracture, which is not true when the union is fibrous, as it is in the large majority of the cases treated by other methods. Not one of these four patients is limited in any way by his injury. One of them is a paper-hanger, who does most of his work on a step-ladder. One patient was over sixty years of age at the time of operation, although the operation in his case was done because of non-union after four weeks of fixation.

The primary results were better in these cases than is usual

in those treated by non-operative methods, that is to say, the patients were out of bed earlier and were earlier allowed to discard splints or any other form of restraint. He believes that in bad cases of fracture of the patella in which suturing is done, the results will compare favorably with those obtained in the simplest case treated by splints and other forms of apparatus. He was of course not prepared to recommend operation in every case of fracture of the patella, and yet believes that the ultimate results will be better in every case treated in this way. One should not for a moment lose sight of the fact that the operation is accompanied by one great risk, namely, that of sepsis, and yet, if surgeons will exercise the same precautions as to cleanliness and technique in these cases that they do in abdominal cases, this risk will amount to practically very little. An occasional bad result may be obtained, but the results in the large majority of cases will be far better. His plan in the past has been only to operate upon complicated cases, those in which it was practically certain that a satisfactory approximation of the fragments was out of the question, and those in which non-union had taken place. He will, however, in the future reduce the restrictions on operative treatment and increase the indications for it. His experience has been, and he is sure that it will be confirmed by that of others, that whenever the patella is exposed in these cases there is always some material between the fragments, usually portions of the ligament, which will prevent the establishment of bony union.

Regarding the technique of the operation, there has already been an enormous amount of discussion. Personally, he believes that the U-shaped incision gives the surgeon a better opportunity to thoroughly cleanse the parts and to approximate not only the fragments of the patella, but also all the torn ligamentous tissue than do the straight or transverse incisions. Through this incision the parts are thoroughly exposed, the joint easily cleared of clots, and the torn lateral ligaments readily sutured. It presents another advantage in that in case drainage is desired it can be obtained at the sides of the patella, the space in which accumulations are most likely to take place. In all his own cases he has inserted a small gauze drain on each side of the patella, and in none of them has there been any suppuration or accumulation of fluid in the joint. These drains of course are removed within a few days. With the longitudinal incision such drainage is practically impos-

sible In making the U-shaped incision the transverse portion of it should be one-half or three-quarters of an inch below the line of fracture This incision he has also employed with the greatest satisfaction in excision of the prepatella bursa, in which cases it is often difficult to thoroughly remove the bursa through a longitudinal incision In but one of the cases which he showed was a non-absorbable suture employed, and in none of them was the suture allowed to emerge upon the articulating surface of the patella Dr Gibbon does not think that wire is necessary for the repair of this fracture, and believes, moreover, that in a large number of cases the fragments may be held in absolute apposition by a careful suturing of the torn ligament about the bone There is no likelihood of a large chronicized-gut suture passed through the fragments giving way if it is properly tied, if the ligament over it is sutured, and the quadriceps extensor relaxed by elevation of the leg There is no lateral shifting of the fragments after operation, as sometimes takes place in long bones, and which is apt to break even a silver suture. The only condition after operation which gives rise to inconvenience and requires treatment is swelling, and this is no greater than in those cases in which other methods of treatment are employed In the majority of cases the splint can be removed in from four to six weeks and the patient allowed to exercise the part Massage after the wound is thoroughly healed does much to prevent subsequent swelling and stiffening of the muscles and joint, and should always constitute a part of the treatment With this idea in view he prefers to dress these cases upon a posterior splint which is easily removed, rather than with a plaster bandage; although, if the latter is cut so that it can be removed and satisfactorily replaced, it serves the same purpose He thinks, also, that elevation of the leg for the purpose of relaxing the quadriceps muscle should be insisted upon during the first two or three weeks.

The first case shown was that of a colored man, fifty-two years of age, operated upon at the Pennsylvania Hospital on the day of his admission, August 5, 1901 The reason for operating in this case was an enormous distention of the joint with blood The fragments were exposed by a straight incision and approximated with a silver-wire suture He was discharged on September 20, 1901 This patient was seen a number of months after the operation, when he had perfect use of the leg, but it has

been impossible to discover his present whereabouts, although a careful search has been made

The second case was that of a man sixty years of age who was operated upon four weeks after his admission to the Pennsylvania Hospital. Operation in this case was done because there was absolutely no union after fixation upon a splint for more than four weeks. The operation was done on October 1, 1902, and the patient discharged on December 31, 1902. The line of fracture was near the tip of the patella. The bone was exposed through a U-shaped incision, the fragments and ligaments surrounding it sutured with chromicized gut. The result in this case is all that could be desired, the patient having no inconvenience and practically no limitation of flexion.

The third case was that of a man twenty-eight years of age operated upon at the Polyclinic Hospital on December 16, 1902, four days after admission. In this case the operation was done because it was found impossible to approximate the fragments. The U-shaped incision was employed and the fragments and ligament sutured with chromicized gut. This case presented a beautiful illustration of interference with approximation due to the interposition of ligamentous tissue. The patient was discharged on January 2, 1903, sixteen days after operation. There was some subsequent swelling, more than in any of the others, and it is thought that it was probably due to the fact that the patient was allowed to get out of bed and leave the hospital too soon after operation. The ultimate result, however, as is shown, is a practically normal knee-joint. The patient is a paper-hanger, doing most of his work on a step-ladder.

The fourth case was that of a man thirty-four years of age who was operated upon at the Pennsylvania Hospital on October 10, 1903, two days after his admission. There was considerable swelling in this case, and approximation of the fragments was impossible. The two modes of treatment were explained to the patient, and he elected the operative. The patella was exposed through a U-shaped incision and found to be fractured transversely near its lower extremity, and the lower portion of the bone was split longitudinally. The fragments were united with chromicized gut, which in the tying cut partially through the lower fragments. The ligament over the bone and at the sides was firmly sutured. The subsequent treatment was the same as

that in the other cases, and the result promises to be as satisfactory

DR RICHARD H HARTE said that while the U-shaped incision had many advantages, he preferred the straight incision. With it the operator gains access to the fracture, and can also clean out the joint and suture the fragments of the patella without disturbing the tissues around the joint. The operative method is the rational way of treating fractures of the patella if the patient is a suitable one for undergoing an operation. The surgeon sees cases that are not suitable,—old people, alcoholics, etc. With these he must do the best he can with extension and counter-extension, posterior splints or other appliances. The trouble with cases treated in this way is that in a very large majority of instances there is not perfect apposition of the fragments, torn ligaments intervening, and thus preventing perfect union, either ligamentous or bony. For suture material Dr Harte has used silver wire, which is usually too stiff to work easily. It can be made more pliable by heating and then plunging in water, but whenever used it is open to the objection that it is a foreign body, and in nine cases out of ten has to be removed. Some surgeons claim to have no trouble with it, but this has not been his experience. Chromicized catgut answered all purposes in the cases reported by Dr Gibbon, and in future cases Dr Harte will employ it instead of wire. The gut will of course not stand extreme tension, but as the only object of the suture is to put the fragments of bone in apposition, this is not a valid objection to its employment. As to the use of motion in cases of fractured patella, Dr Harte has been conservative, and prefers to leave the leg in a plaster case for a long time. In some instances, if the support is removed in six weeks a refracture results, the newly-formed material not yet being solidified. When the fragments are put in apposition by operation good bony union should result. The bone breaks as does a bent lever with weight on both ends, and hence the necessity of firm union before use of the leg is allowed. Instead of taking off the splint in six weeks, he would prefer to leave it on for an additional three or four weeks. The cases of Dr. Gibbon, however, which were released earlier, show excellent results.

DR WILLIAM L RODMAN agreed with the previous speakers that operation is not advisable in all cases of fractured patella, yet an increasing number should be operated upon. In none of the

cases upon which he has operated could satisfactory union have occurred without such intervention, as there were large blood-clots in the joint, the fragments of the bone were tilted, or torn ligaments projected between them. In all favorable cases occurring in young people who lead an active life, and where the use of the limb is of great importance, the surgeon should explain the dangers of operation, for it is accompanied by certain dangers, and then, if the patient so elects, he is entitled to operation. Dr Rodman has never used the U-shaped incision, employing instead the transverse or slightly curved incision, practically that of Kocher. If holes are to be drilled in the fragments of bone, the transverse is better than the longitudinal incision. That the U-shaped incision increases the facility of drainage as stated by Dr Gibbon, he is ready to admit, but he has never employed drainage, and thinks it is not desirable in the majority of cases. In his last few cases he has obtained excellent results from the employment of Stimson's operation. Where the joint is thoroughly emptied, irrigated, and the limb elevated, as good results follow suturing of the fibroperiosteum alone as in cases where the bone is drilled and sutured. Drilling the fragments adds traumatism and increases the danger of infection. The question of suture material is an important one. In his earlier cases Dr Rodman used silver wire, which in the first two remained without producing irritation or in any way causing trouble. In the third case one suture produced some pain, and later was removed under cocaine. He agreed with Dr Harte that silver wire is not always a perfectly safe suture material, as it may cause pain, be extruded, or necessitate removal. Chromicized catgut may answer the purpose, but he prefers wire or silk, which are safely and quickly sterilized by boiling. Gut is uncertain. In his last cases he has employed the Pagenstecher or celluloid suture, and finds that it does well. In two cases it gave absolute satisfaction, and he will continue its use, suturing the fibroperiosteum instead of drilling the bone. In conclusion, Dr Rodman said that he fully believed in the operative treatment for fractured patella in the vast majority of men under fifty years who lead an active life. In patients beyond fifty, especially if there is visceral disease, it is a dangerous operation. Furthermore, it is an operation that should never be performed outside of a thoroughly appointed hospital, and then only by a trained operator, with the aid of competent assist-

ants and nurses. Asepsis is here of the greatest importance. The subcutaneous operation of Barker is very dangerous, and if any operation is to be done it should be an open arthrotomy with thorough irrigation of the joint with sterile salt solution, no antiseptics being employed. Then drill and suture the bone or do the operation of Stimson.

DR WILLIAM J TAYLOR said that within the last two weeks he had operated upon a fractured patella in a woman, and found the joint full of blood-clots, with lacerated soft tissue between the fragments of the bone. An important point was that the lower fragment had become tilted in such a manner as to bring its articular surface in apposition with the fractured surface of the upper fragment, although externally reduction appeared to be complete. In cases of fractured patella in people who are actively employed in earning their living, operation should be done. Dr Taylor has never yet regretted its employment, in every instance finding something interposed between the fragments that would have prevented union.

DR WILLIAM G PORTER said that examination, years after the receipt of the injury, of many cases of fractured patella not treated by operation will show that, while the anatomical result is not perfect, the function of the part is as good as before the injury. In some instances three or four fingers may be placed between the fragments, and yet the patients have good use of the leg. He believes that opening the joint in cases of fractured patella, unless under very exceptional circumstances, is not warranted.

DR JOHN B ROBERTS said that arthrotomy did not seem to be so desirable an operation as we ought to have for cases of fractured patella. If it is to be done only by the most experienced surgeons, in the best appointed hospitals, etc., it is evidently not the kind of an operation to be done in the majority of cases. He believes that while the majority of surgeons are competent to perform this operation, there is something better for the average surgeon in the average hospital with the average nurses in attendance. He has employed a simpler method with as good results and with less danger of sepsis and less necessity of perfect surroundings. This is the passing of a silk suture around the broken patella to act as a purse-string. It has been stated by several speakers that we must open the joint because clots and serum are present. If we open the joint in these cases we find the blood

and serum, but if we do not open it, nature cares for them by absorption, as she has been doing for years before the open operation was advocated. Dr Roberts is not convinced that union will not occur even if there be fragments of periosteum between the bony surfaces after fracture. Every surgeon has seen that condition present in cases of comminuted fracture, and has seen that the periosteum did not hinder union, it being a tissue closely allied to bone. It is desirable to remove such portions of periosteum from between the fragments, and it can be done when operating without opening the joint. If the limb be elevated until flexion of the hip is secured, the tension of the rectus muscle attached to the patella will be relieved and the fragments may be approximated. If now the fragments be grasped firmly and rubbed together, the pieces of periosteum between them can be displaced. It may be noted in some of these cases that a dull, obscure crepitus at the beginning of the manipulation will be followed by a sharp, bony crepitus as the fragments of periosteum are crowded away. A long needle armed with silk, or catgut if preferred, is then used to encircle the patella with a suture through tendon and aponeurosis, four punctures being made. This can be done without opening the joint unless that be done occasionally by making a puncture deeper than it should be. This suture insures apposition of the parts whether the aponeurosis or the bone, or both, be torn or fractured, any one of which conditions may be present in an individual case. This method of coaptation is a simple procedure and does not invade the joint. Hence the absolutely perfect aseptic surroundings needed for open arthrotomy are not absolutely necessary here. The union of the bony fragments following this method may not always produce such anatomical smoothness of the patella as seen in the cases exhibited by Dr Gibbon. A slight tilting may result, but satisfactory function has been secured in the cases thus treated by Dr Roberts. One man is able to carry kegs of beer up and down stairs as well as before the fracture.

DR GIBBON, in closing, said that the surgeon treating a case of fractured patella should bear in mind that he is dealing not only with a fractured bone but also with a fractured ligament. The lateral ligaments of the joint beyond the patella are practically always torn, there often being more bruising and tearing here than over the bone itself. With the U-shaped incision these areas can

be reached and the ligament repaired. By drainage in these cases he does not mean to drain under the patella, but only the points where the ligaments are sutured. He always feels safer with drains from those injured areas. As to the method of rubbing together the fragments of bone in order to liberate the ligaments, and passing a subcutaneous suture, as advocated by one of the speakers, entering the joint may be avoided, but he thinks there will be encountered as much risk of infection as though the joint were opened. Arthrotomy is unquestionably an operation of gravity, but its successful performance is simply a question of aseptic habit. Dr Porter's large experience in the treatment of fractured patellæ without operation is of great value, but he has seen stiff joints follow treatment by the old methods. Where there is separation of the fragments, the person may be able to do his work fairly well, but there is always the tendency to stumble, particularly when going upstairs. Refracture is also not uncommon in these cases. In answer to a question by Dr Taylor, Dr Gibbon said that he used a splint at first and plaster dressing later, if at all. A straight splint is applied, and the leg kept well elevated on pillows. If the fragments of the patella are approximated for three or four weeks without tension, bony union will be secured as in fractures elsewhere.

CLEFT PALATE

DR RICHARD H HARTE exhibited this case as an illustration of what can be accomplished in unpromising cases if they are dealt with vigorously. The patient was a young man who had been operated upon unsuccessfully when he was five years of age. When first seen by Dr Harte there was present a large cleft bounded partially by scar tissue resulting from the previous operation, and benefit from operative interference seemed doubtful. A trial was decided upon, a modification of Langenbeck's operation being employed. The various steps in the procedure were illustrated by blackboard drawings, two points made emphatic, being the avoidance of injury to the blood supply of the part and the working up of sufficiently large periosteal flaps to close the cleft without tension on the tissue. Failure will ensue in all cases where tension results from suturing, and its avoidance is of first importance in all cases. Dr Harte has met with failure in the use of Feiguson's operation. There the operator has to

secure osteoplastic flaps, and this, in his experience, has led to very unsatisfactory results. In the case exhibited he was much handicapped during operation by the difficulty of using the mouth-gag, due to the absence of molar teeth in the patient, who was also difficult to etherize, as he constantly struggled. The operation was performed with the head of the patient lower than his body in order to allow the material collecting in his mouth to escape instead of being drawn into the air-passages. A large, pendulous uvula was removed. In these cases the surgeon seeks to attain two results: first, to close the communication between the nasal fossæ and the mouth; second, to improve the speech of the patient. Many people are under the impression that they can speak plainly as soon as the opening in the palate is closed. This is not the case, as speech follows partly as the result of education of the parts. Hence, there is a certain time in which it is most desirable to operate. This is about the time that the child is beginning to talk, as the ability to make sounds will then be more easily acquired. Operation on children under one year of age is followed by a large mortality. One child operated on by Dr. Harte spoke with great difficulty until it was put under the care of an elocutionist, who was also a throat specialist. As the result of this training the child now speaks very well.

DR. JAMES K. YOUNG approved the use of Roser's position in such cases, as it makes the operation easier and safer. He has seen sloughing occur in cases operated on by the method described, but in this instance the incisions were not carried back far enough to endanger the blood supply. Closure at the age mentioned is preferable to operating on very young children. In one case he operated at the age of one month, removing a large part of the maxillary bone, but hæmorrhage was severe. In double harelip and cleft palate it is best to operate between the ages of seven and fourteen, doing the plastic operation of the French.

DR. JAMES P. HUTCHINSON, who had seen Dr. Harte operate upon the case reported, said he had seen many cases operated upon, but in none had a better result been secured. The operative difficulties were here very great, because two surgeons had at different times trimmed away portions of the tissue surrounding the cleft. The difficulties were also increased by the fact that the patient took ether very badly. When the heads of the patients are not lowered during these operations, they take ether very

much better, and thus make the work of the surgeon much easier. The Roser position is therefore not approved.

DR JOHN H GIBBON spoke of the management of the premaxillary bone. In operating upon one case of double harelip with complete cleft of the palate, forming a Y-shape opening with the premaxillary projecting forward, he made an unsuccessful attempt to push back that bone, finally being obliged to remove it. When attempting to push back the bone, it was found that it twisted upon itself, as stated by some authorities, who speak of the teeth rotating in such a way that it is almost impossible for dentists afterwards to align them. The opening in the lip and palate can be better closed, in many cases, if the bone be removed. Dr Gibbon has by this means secured good results in two cases.

DR JOHN B ROBERTS spoke of the frequency of unsatisfactory results as to speech in his own cases, and that he had recently been trying obturators with a flexible velum instead of operative closure of cleft palate. He asked whether the speech was good in Dr. Harte's case.

DR HENRY R WHARTON said that he employed practically the same operation as that described by Dr Harte. The important point is to get free, thick flaps which can be approximated without tension. He uses silkworm-gut sutures, clamped by shot. Operation on children under three years is not recommended, between three and four being the best age. In one series of three cases operated upon recently perfect union was obtained in two. The third had a profuse mucopurulent discharge from the nasopharynx. This was washed out thoroughly before operation, but it persisted and infected the wound, causing every suture to cut out, leaving a wide gap in the tissues.

DR HARTE, in closing, said that for suture material he uses the black, iron-dyed silkworm gut, which is allowed to remain in for eight to twelve days. The sutures are clamped by small shot, this method giving better approximation, and also enabling one to judge of the degree of tension employed. The nutrition of the flap is of the very greatest importance. If one goes indiscriminately into the roof of the mouth, sloughing is apt to occur. This result is sure to follow the sacrifice of the palatine vessels. A good working rule to follow is to keep close to the alveolar border and secure a wide flap. In doing this there is apt to be furious bleeding, but this can usually be controlled by temporary packing.

Dr Harte considers it preferable to keep the head down during operation, as the air-passages are thus kept free of blood

APPARATUS FOR DETERMINING ASYMMETRY OF THE LOWER EXTREMITIES

DR JAMES K. YOUNG said that the study of asymmetry in the lower limbs has attracted the attention of the surgeon for a quarter of a century. Prior to the excellent work of Morton in 1880, the subject was a menace to the medical profession in medicolegal cases, and Hunt has left us a record of the first trial for malpractice in which these facts collected by Morton were successfully used before a legal tribunal.

The excellent work of directors of physical training in our schools demonstrates the fact that asymmetry has not decreased, but that it is more frequently recognized to-day than formerly.

In order to determine the degree of unilateral development of the lower extremities, it is important to have some apparatus which will record any inequality quickly and certainly. It is also important to determine the degree of inclination of the pelvis both posteriorly and anteriorly. For this purpose he had constructed an apparatus consisting of a box with two movable platforms (Figs 1 and 2). To the under surface of each is attached a vertical ratcheted bar worked by a horizontal pinion, the end of which projects beyond the box and is operated by a lever. By depressing the lever, the platform is elevated one-sixth of an inch for each tooth, and secured by a catch which may be instantly released at any point. The surface of the platform should be tested with a spirit-level before use.

The method of using the machine is as follows. The patient with clothing removed stands upon the platforms with one foot on each side of the median line. The anterior superior spines of the ilium are marked with a skin pencil, and a spirit-level is held in position while the foot-piece is gradually raised. If the longer limb be raised the deformity is increased, the spirit-level is made more uneven, but if the shorter limb be raised the deformity will disappear, and the spirit-level will indicate the equality of the limbs.

The restoration of the asymmetry can be readily recognized by observing the outline of the body, the spinal column, the cleft of the nates, and the iliofemoral folds. When the deformity is

FIG 1

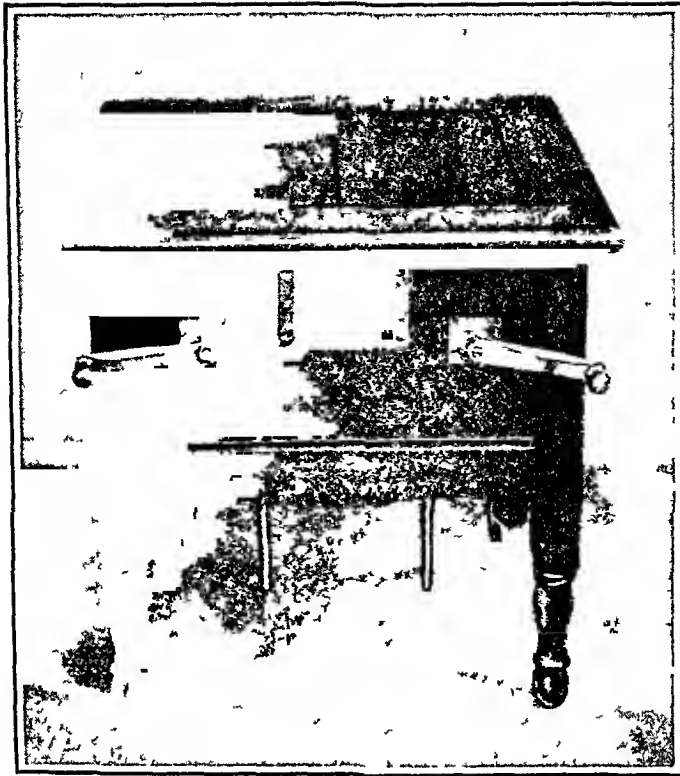
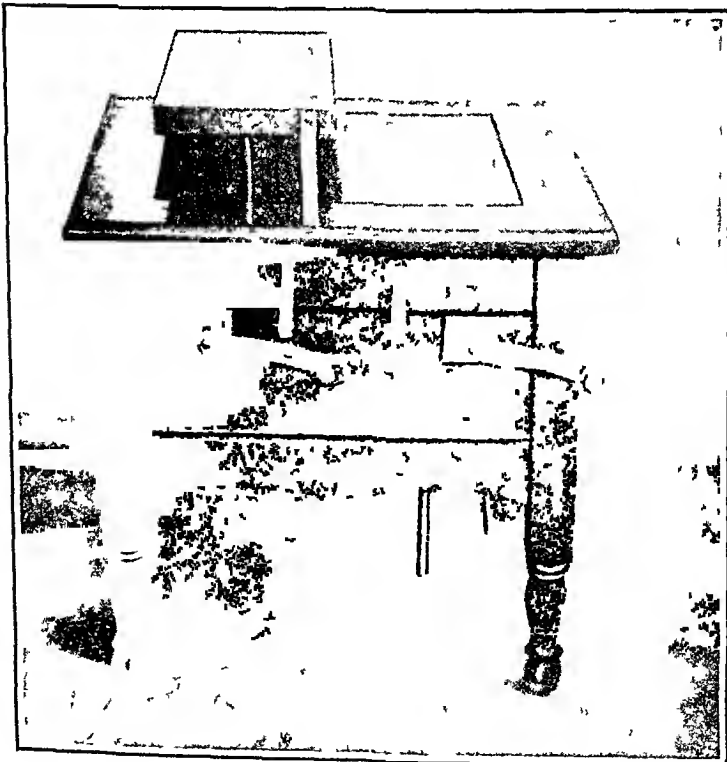


FIG 2



Apparatus for determining asymmetry of the lower extremities

corrected, the spinal column will be straight, the cleft of the nates will be continuous below the spinous processes, and the ileo-femoral folds will be level. The same method is employed to determine the inclination of the anterior superior spines in order to discover any anterior obliquity of the pelvis.

In making all measurements, old fractures, unilateral rhachitic deformities, flat foot, etc., should be recorded, or eliminated from the test in order to make it more valuable.

This machine resembles that devised by Dr T S Morton, but differs from it in several respects. In general form the top is the same, but the action is quicker, the release instantaneous, and the mechanism is a ratchet and pinion arrangement instead of strong vertical and horizontal screws. This machine is also more portable, and is less cumbersome in appearance.

THE TREATMENT OF FRACTURES OF THE CONDYLES OF THE HUMERUS

DR E HOLLINGSWORTH SITER said that he had found that this injury occurs more often to children than to adults, as of forty-eight cases, of which he had taken memoranda from his case-books, nine were adults and the remainder were children.

All the fractures of which he spoke were about the condyles of the humerus. Some of them involved both condyles, some of them only one. He had found no favoritism as to the arm (whether right or left) or of the condyles (whether external or internal).

The method of treatment employed was what is usually called the Jones method, that is, without splints. The method briefly is, after reduction hang the arm by the wrist to the patient's neck at an acute angle. It can be hung by a piece of broad bandage or any apparatus or material thought best.

After the reduction a bandage was loosely applied from above the point of fracture down to and including the hand while the arm was acutely flexed. Over the injury any lotion or ointment may be applied before the bandage is adjusted.

The arm is then hung about the neck as described. In twenty-four or forty-eight hours the dressing is removed, the arm and hand washed with alcohol, the bandage is reapplied and rehung from the neck at a slightly less acute angle.

The patient should be seen certainly every other day, and the

angle changed, and made either more or less acute. At the end of three weeks the angle will be about a right angle.

The patient, if a child, is then allowed the free use of the arm, and is only to be seen every three or four days for the next two weeks. This is done more as a precaution than from necessity, as he had found that the patient has practically recovered in three weeks from the first dressing.

This method seems to be practically painless. There is no complaint when the angle is changed, and there are no adhesions to break up.

In adults it seems best to retain the dressings a week longer. He had frequently had children unconsciously remove their arms from the sling at the end of two weeks, use them, and only return them to the sling when told to do so by the parent or attendant.

He detailed the following cases selected at random from his memoranda.

CASE I — J. M., aged nine years. History of having fallen off some steps. Found to have fracture of external condyle of left humerus.

Fracture was reduced. Dressed by Jones method. Dressing changed on second day. Angle lessened. No pain, some tenderness. Dressed every other day and angle changed. In two weeks angle was a right angle, and patient wished dressing removed permanently. At three weeks dressing removed, and there was found no deformity. A limit of motion just perceptible.

CASE II — R. T., aged seven years. History of having fallen from a wagon. Both internal and external condyles of right humerus fractured.

Dressed with lead water and alcohol in Jones's position and angle changed every second day. Right angle reached in seventeen days.

Dressing removed on twenty-third day. No limit of extension or flexion.

CASE III — C. L., aged twelve years. Fell from tree. Fractured both condyles of right humerus. Reduction was accomplished and the arm dressed. Angle changed in forty-eight hours, and thereafter every two days. Dressing removed and arm free on the twenty-second day. No loss of motion.

CASE IV — F. M., aged ten years. History of falling on the ice. Fracture of external condyle of left humerus. Reduced and

dressed Angle changed at intervals Dressing removed on twenty-third day Motion was unimpaired This patient, eighteen months previously, fractured her external condyle of the right humerus by a fall from a wagon This injury was kept on an internal angular splint for four weeks, and after repeated breaking of adhesions and manipulations her motion is only one-half

CASE V—M S, aged twenty-four years Fell from car Fractured external condyle of right humerus Reduced and dressed Angle changed in forty-eight hours, and afterwards every second day Dressing removed on the twenty-ninth day Motion was normal

CASE VI—F P, aged fourteen years Fell from a hay-wagon Condition was not diagnosed, but an anterior angular splint had been applied He was seen one week after the injury, and at that time had some swelling, and motion in any direction was painful He had fracture of both condyles of the right humerus He was dressed in an angle as acute as possible in view of the pain occasioned by movement This was approximately a right angle He was dressed daily, and the angle made more acute at each dressing until he was at extreme flexion, which was accomplished in ten days The hand was then gradually lowered until it was at a right angle again On the twenty-fourth day the dressing was removed and the motion was normal

The conclusions he drew from his cases were that, with this dressing applied and the patient seen at short intervals, fractures of the condyles of the humerus can be made to unite with practically no loss of motion The change of position is so gradual that it causes no amount of distress There is none of the painful, forced motion, there is no swinging of weights for months, with probable loss of one-half of the motion

In the few cases he had treated with splints he had lost from a quarter to a half of the range of flexion and extension

This dressing he had also found of great service in all injuries about the joint, except, of course, injuries to the olecranon

DR JOHN H GIBBON reinforced the remarks of Dr Sizer regarding the use of the Jones position in the treatment of fractures about the elbow For the past seven years he had used no other method It has a great many advantages over the splint He usually puts the arm between the shirts of the patient in order to keep it in position, and does not use rubber bands about the

wrist, as they are a source of discomfort. A child will get extension if the arm is thus treated in flexion, but one is never sure of obtaining perfect flexion if the arm is treated in extension. Nearly all the usual forcible movements of a child's arm tend to develop extension, such as throwing, climbing, etc., and but few tend to the development of flexion.

DR WILLIAM J TAYLOR indorsed all that had been said regarding the value of the Jones position. In the first case in which he employed that method he etherized the patient and produced a forced supination of the arm, and then placed it in flexion. The final result was perfect. He thinks it is wise, in a majority of cases, to etherize and forcibly supinate the forearm. It is a mistake to bind the arm to the side after it is put in position, as no displacement of the fragments can occur if the hand is kept to the neck.

DR FRANCIS T STEWART said there were two contraindications to the employment of the Jones position. One is great swelling of the parts, which mechanically interferes with flexion, the other is intense pain caused by the engagement of the ulnar nerve between the fragments of the fractured bone. In instances of the latter complication, it will be found that the patient is comfortable only when the arm is placed in extension.

DR JOHN B ROBERTS asked if the carrying function of the arm was preserved in the cases treated by the method under consideration. This is as important a question to consider as is that of ankylosis of the elbow.

DR SILER, in closing, stated in reply to the question of Dr Roberts that the carrying function in the arms of patients treated by the Jones method was normal.

VOLVULUS OF THE ENTIRE MESENTERY

DR A D WHITING reported the following two cases, which he was privileged to report through the courtesy of Dr John B Deaver. P K, male, aged five years, was admitted to the Mary J Drexel Home with a history of having been sick for five days, during which time he suffered from nausea and vomiting, with inability to expel flatus or fecal matter. When admitted to the Home, he was shocked, being very weak, with cold, clammy skin, and a rapid running pulse. The abdomen was markedly distended. Rectal enemata were retained, being recovered through a rectal

tube, not discolored. The patient did not react under treatment and died twelve hours after admission. Partial post-mortem examination revealed the following. Peritoneal effusion of a sero-sanguineous character was present in large amount. The omentum was small, irregular in shape, with small amount of fat. There were no peritoneal adhesions and no exudate. The stomach was normal in size, but was pushed upward by the distended small bowel. The duodenum was normal, but slightly congested. The remainder of the small bowel was markedly distended and of a dusky hue. The bowel was drawn out of the abdomen, when it was found that the root of the mesentery was so twisted on itself that it appeared like a cord. The turns of the mesentery were from right to left. The number of turns was not noted. By lifting the small bowel *en masse* the mesentery was readily untwisted.

The doctor who made the necropsy became infected during the examination, the infection being so virulent that, in spite of the most active treatment, he suffered from general septicæmia, from which it was feared he would not recover. This unfortunate termination was, however, happily replaced by a perfect recovery after a tedious illness.

The second case was C. B., male, aged thirty-four years. He had had an attack of acute appendicitis in October, 1902, for which he was operated in the German Hospital. The appendix was gangrenous, the intestine was injected, inflated, and covered with lymph. There was a local collection of pus at the base of the appendix. The appendix was removed, the abdominal cavity was cleansed as thoroughly as possible, and four pieces of gauze were inserted for drainage, no attempt being made to close the wound. A fecal fistula developed, which, however, closed without operation before the patient left the hospital. After his discharge, he suffered from intermittent pains in the right iliac fossa and along the line of the cicatrix. He was examined on May 22, 1903, at which time he complained of constipation, loss of appetite and dull pain in the right iliac fossa. The scar was firm, the abdomen soft, with no points of tenderness. At 5 A. M., May 29, 1903, while the patient was walking upstairs, he was suddenly doubled up with most severe pain at the site of the cicatrix. He was nauseated, but did not vomit. He had had a bowel movement in the morning, but from the time of the onset of the violent

pain until after a subsequent operation he did not pass either flatus or faecal matter. He was admitted to the German Hospital about 8 P M of the same day. He was in great distress, with severe cramp-like pains over the entire abdomen, but most marked in the right iliac fossa. The abdomen, which was slightly distended, was very tender. The recti were rigid. There was a large hernial opening at the site of the cicatrix which had not been present one week before. The temperature was $97\frac{2}{5}^{\circ}$ F, pulse, 58, and respirations, 26. A diagnosis of acute intestinal obstruction was made, probably due to adhesions, and immediate operation advised, to which consent was given.

Operation at 9 P M, about four hours after the onset of pain. Under ether anaesthesia, an incision was made round the cicatrix. In dissecting the caecum from the anterior abdominal wall, to which it was firmly adherent, it was unintentionally opened, but immediately closed with two rows of Lembert sutures. Inspection showed the intestine near the ileocaecal junction to be bound together by dense adhesions, some of which were as large as the little finger, with partial obstruction. With the exception of the last portion of the ileum and the duodenum, the entire small intestine was partially collapsed, lustreless, and of a dusky red color. This portion of the bowel had a doughy feel. All adhesions were separated, the denuded surfaces being covered with cargile. The small bowel was then drawn out of the wound in a search for the cause of the peculiar condition of the gut. It was discovered that the entire mesentery was twisted upon itself, about a three-quarter turn, from left to right. The bowel was lifted up in a towel and the entire mass turned from right to left. This relieved the twist in the mesentery and returned it to its normal position. The circulation of the bowel was immediately re-established, the normal color and lustre rapidly returning. The separate layers of the abdominal wall were dissected out and the wound was closed with tier sutures of silk. Five hundred cubic centimetres of salt solution were injected into the rectum before the patient left the operating table. He reacted well. Flatus was passed through a rectal tube six hours after the operation, and voluntarily six hours later. The bowels moved freely on the second day. With the exception of slight infection of the lower part of the wound, the patient had no unfavorable symptoms, and was discharged from the hospital on the seventeenth day after operation.

These two cases demonstrate the value of early operative interference in cases of intestinal obstruction. The first case was brought to the surgeon when the patient was practically moribund, and of course no relief could be afforded. It is probable that the perfect recovery made by the second patient was largely due to the short interval which elapsed between the onset of the acute symptoms and the time of operation, about four hours. The second case also shows the value of thorough inspection of the abdomen in cases of obstruction.

In a very interesting article published in the *American Journal of the Medical Sciences* for May, 1903, Dr George Tully Vaughan cites twenty-one cases of volvulus of the entire mesentery. Seventeen of these were operated with four recoveries, a mortality of about 76 per cent. This mortality, as stated by Dr Vaughan, is due to three causes. First, the serious nature of "a condition which strangulates almost the entire small intestine, injures the sympathetic plexus, and perhaps produces a rapidly fatal toxæmia." Second, delay in operating, and, third, "the difficulty in recognizing the true conditions in order to act intelligently, four of the operators cited confessing their inability to do so after opening the abdomen. The patients died without relief, the true condition being at last discovered at the necropsy."

DR JOHN B ROBERTS gave brief notes of a case upon which he had operated about a year ago at the Polyclinic Hospital. The man was in an extremely bad condition, with marked abdominal distention and other signs of intestinal obstruction. When the abdomen was opened, there was some difficulty in determining the exact nature of the lesion. It was finally found that the entire mass of small intestines was twisted on the mesentery. The obstruction was relieved, but the patient soon afterwards died.

REVIEWS OF BOOKS

THE LYMPHATICS By G DELAMERE, P POIRIER, and B CUNEO Authorized English Edition, Translated and Edited by CECIL H LEAF 117 Illustrations Pp 301 Chicago W T Keener and Co, 1904

This important work forms one volume of a "Treatise of Human Anatomy," edited by P Poirier and A Charpy, and under the general title includes the general anatomy of the lymphatics by G Delamere and special studies of regional lymphatics by P Poirier, Professor of Anatomy in the Faculty of Medicine, Paris, and B Cuneo, Associate Professor in the same body The translator, Cecil H Leaf, M A, M B, F R C S, is Assistant Surgeon to the Cancer Hospital, and is associated with other London institutions The names of all are well known in the field of anatomical research, and are sufficient evidence of the high quality of the work

The histology of the lymphatic system, as presented here by Delamere, comprises the structure of the finer lymph spaces and channels, the nodes and glands, and the leucocytes His review of the literature of the latter subject is particularly complete, and shows an amount of patient investigation that is evident without the testimony of the seven pages of references

Our insufficient knowledge of the leucocytes is emphasized by the varying views quoted by M Delamere, there being almost as many opinions as observers The writer chooses to classify the white cells as microcytes (lymphocytes of Emhorn, Ehrlich), macrocytes (large mononuclear), cells with neutrophile granules (neutrophile cells), cells with acidophile granules (eosinophile cells), and cells with metachromatic basophile granules (mast-

cells of Ehrlich) This choice of terms he justifies from a critical study of the various classifications that have been offered from time to time, as well as by conclusions based on his own observations

The need of a rational and fixed terminology may be drawn from a glance at the long list of synonyms attached to each variety, the writer instancing fourteen different names besides "microcyte" for this sort of cell alone

The general minute anatomy of the lymphatic vessels and glands is taken up by the same author after a description of the methods of preparation employed He gives considerable space to Sappey's methods of injection with mercury and Gerota's with Prussian blue and other substances, and mentions a variety of other methods

The author contends that the lymph capillaries are invariably closed channels, having no communication with either connective-tissue spaces, serous membranes, or the blood-vessels

Of the lymph glands, he concludes that they are true secretory organs, producing leucocytes and certain ferments of undetermined nature, and acting as centres for cytolysis He disputes their power to produce red cells, but concedes the occasional presence of active bacteria in apparently normal glands

The second section of the book contains special studies of regional lymphatics by Messrs Poirier and Cunéo To these dissections and injections with the accompanying descriptive text one must accord entire approval They reflect a high degree of patient, thorough, and scholarly workmanship It would be difficult to indicate one portion that excels more than another, unless the choice be left to the interested reader, who will naturally turn to that portion of the anatomy in which his specialty lies The bibliography is particularly full

The following excerpt may prove of interest "Clado has described an anastomosis between the lymphatics of the appendix and those of the right ovary, this anastomosis runs in the appen-

diculo-ovarian ligament Tixer and Viannay have found a small lymphatic gland in this fold We have never proved the existence of the anastomosis described by Clado, and we formally deny its presence "

Of the general appearance of the book, it may be said that the letter-press is excellent, the illustrations—many of them colored—numerous and beautiful, and the arrangement convenient The translator's laudable desire to preserve the French construction does not permit of a particularly easy style, and in places interferes with perfect clearness of construction A good index would add greatly to the usefulness of the book

HENRY GOODWIN WEBSTER

A SYSTEM OF PRACTICAL SURGERY By Drs E VON BERGMANN, of Berlin, P VON BRUNS, of Tübingen, and J VON MIKULICZ, of Breslau Edited by WILLIAM T BULL, M D, New York To be complete in five volumes Volume I 936 pages Philadelphia Lea Brothers & Co, 1904

Volume I of von Bergmann's Surgery has reached its second edition in the original German, and it is from this edition that the English work has been translated and edited by William T Bull and Walton Martin, of New York The second German edition was edited by Drs von Bergmann, von Bruns, and von Mikulicz

In publishing the American edition, many references to American and English methods have been added The number of illustrations has also been increased

In the present volume one misses the chapters on Bacteriology and General Pathology which are wont to occupy the first few chapters of systematic works on Surgery, for von Bergmann immediately takes up the Injuries and Diseases of the Skull and its Contents In fact, the entire volume is devoted to the surgery of the head

Krause has contributed two chapters concerning the Neuralgias of the Head Being an acknowledged leader in this

branch of surgery in Germany, his contribution commands special interest, and is of great value.

Lexer, of Berlin, Privat-Docent at the clinic of von Bergmann, discusses the Malformations, Injuries, and Diseases of the Face. In connection with this he makes an extensive review of plastic surgery in general, and adds many original observations upon plastic operations.

The chapters by Kronlein, Kummel, and Kuttner are also exhaustive and deserving of special mention.

The evident intention of this work is to present to the reader the entire field of surgery, each section being written by one who is a recognized leader in that special branch of the subject.

There is nothing startling in the present work. It is simply an encyclopædia of surgery in which the greatest surgical minds of Germany find expression.

PAUL M. PILCHER.

TEXT-BOOK OF OPERATIVE SURGERY. By THEODOR KOCHER. Authorized Translation from the Fourth German Edition by HAROLD J. STILES, M.B., F.R.C.S. (Edin.). London: Adam and Charles Black, 1903. New York: The Macmillan Company.

In this edition Professor Kocher draws especial attention to the modifications in his operations for extirpation of the tongue and excision of the larynx. The chapters on Anæsthesia, Treatment of Wounds, Trephining, Amputations, and Excisions, and numerous other portions of the volume, have been rewritten.

The author still lays great stress upon the choice and direction of the initial incisions.

Of great interest is the section on the radical cure of inguinal and femoral hernias. The methods as described by Kocher are so simple and the results reported so uniformly good that the procedures recommend themselves to the surgeon. However, in the hands of many other operators they have not met with such

favorable results. It will be noted that Kocher has departed from his earlier method of applying torsion to the sac and laying it along the anterior wall of the inguinal canal. It is acknowledged that by such a procedure the vitality of the sac is so much lowered that necrosis is apt to occur.

In preparing a patient for excision of the tongue, the same rigid rules for asepsis are adhered to. Since publishing the third edition of his book, Kocher has modified his operation for excision of the tongue very considerably, and the present edition describes his new method of splitting the lower jaw, which makes the operation much more simple and easy to perform.

The section treating of Goitre is without question the masterpiece of the work.

The book needs no special recommendation from the reviewer. Its four editions, and its translation into English, French, Russian, Spanish, and Italian, bear sufficient testimony to the value of the work.

PAUL M. PILCHER

TO CONTRIBUTORS AND SUBSCRIBERS

All Contributions for Publication, Books for Review, and Exchanges should be sent to the Editorial Office, 386 Grand Ave., Brooklyn, N. Y.

Remittance for Subscriptions and Advertising and all business communications should be addressed to the

ANNALS OF SURGERY,
227-231 South Sixth Street, Philadelphia

INDEX TO VOLUME XXXIX.

A

Abdomen, Contusion of, with rupture of the, 282, Gunshot wound of the, 100, with perforation of the stomach, 1002, penetrating wounds of the, Treatment of, 356 469

Abdominal muscles, Extensive subcutaneous laceration of, 979, wall, Approximation of the aponeurosis of, for the prevention and cure of hernia, 245, wounds, Closure of, 320

Actinomycosis of jaw, 459

Adrenal tumors, 299

Air-passages, Foreign body in the, 1019

ALLIS, OSCAR H., The treatment of fractures, 817

Amputation at ankle-joint, New osteoplastic method for, 790

Anæsthetics in children, Comparative value of, 814

ANDREWS, E. WYLLYS, The use of the McGraw elastic ligature in gastro-enterostomy, 145, Decapsulation for chronic nephritis, 617

Aneurisms, arteriovenous, Treatment of, 767, Traumatic, of the internal carotid artery, causing pulsating exophthalmos, 649

Animal cage for laboratory use in experimental surgery, 991

Ankle-joint amputation, New osteoplastic method of, 790

Anus, Rectum, and Pelvic Colon, Review of Tuttle on Diseases of, 631

Aponeuroses the supporting structures of the abdominal wall, their

approximation for the prevention and cure of hernia, 245

Appendiceal abscess, Perforation of the urinary bladder by, 265

Appendicitis, Operation followed by intestinal obstruction, 584, 592, Operation for, followed by hernia, 128, with multiple severe complications, 132, with retrocolic abscess, 102

Appendicostomy for chronic ulcerative colitis, 268, for multiple papilloma of the colon, 269

Arm, crushing injuries of, Conservative surgery in, 462

Arteriovenous aneurisms, Treatment of, 767

Arthrotomy for irreducible subcoracoid dislocation, 591

ASHHURST, ASTLEY PASTON COOPER, Intestinal perforation in typhoid fever, 8

Asphyxia, Traumatic, 481

Asymmetry of the lower extremities, Apparatus for determining, 1032

Axillary artery, Rupture of, complicating fractured clavicle, 1111, vessels, Injuries to, during operations for carcinoma of breast, 757

B

BALIOCH, EDWARD A., Fibromata of the tunica vaginalis, 396

BARNARD, HAROLD L., Pulsating exophthalmos due to traumatic aneurism of the internal carotid artery, 649

BEACH, H. H. A., Traumatic asphyxia, 481

- BECK, CARL, Costal and thoracic resection for pyothorax, 403
- Bergmann, Bruns, and Mikulicz, System of Practical Surgery, translation, edited by W T Bull, Vol 1, Review of, 1042
- BEVAN, ARTHUR DEAN, Interscapulothoracic amputations, 135, Use of the McGraw elastic ligature, 146, Polycystic kidney, 467, Hypernephroma, 468, Treatment of perforating wounds of abdomen, 470, decapsulation for chronic nephritis, Condemnation of, 629
- BICKHAM, WARREN STONE, Treatment of arteriovenous aneurisms, 767, Text-book of Operative Surgery, Review of, 824
- Bladder, Large fibrinous concretions removed from the, 256, Perforation of the, by an appendiceal abscess, 265, Vaginal incision of, for intravesical manipulations, 822
- Bladder calculi following suprapubic prostatectomy, 436
- BLAKE, JOSEPH A, The lymphatic constitution, 814, Operative relief of umbilical hernia, 1003, Effects of smokeless powder, 1006
- Blood, The Clinical Pathology of the, Review of Ewing on, 155
- Blood-pressure in surgery, 310
- Bowels, Spontaneous gangrene of, from mesenteric occlusion, 554
- Brachial plexus, Rupture of, complicating fractured clavicle, 1011, Rupture of, without fracture of clavicle, 1013
- Brachydactylia, 453
- Brain and Spinal Cord, The Anatomy of the, Review of Santee on, 317
- Breast, Injuries to the axillary vessels during operations for carcinoma of the, 757
- BREWER, GEORGE E, Gunshot wound of stomach, liver, and gall-bladder, 100, Retrocolic abscess from appendicitis, 102, Common duct stone without characteristic symptoms, 103, Common duct stone with acute septic cholangitis, 104, Strangulated inguinal and properitoneal hernia, 290, Epiphyseal separation at head of humerus, 291, Postoperative intestinal obstruction, 592, Traumatism of the kidney, 597, Perforating gunshot wound of the stomach, 1002, Umbilical hernia, 1005, Bright's disease, Surgical treatment of, 617
- Bronchoscopy, 194
- Bronchus, Foreign body in the, 1019
- BROWN, F TILDEN, Excision of knee for flexure ankylosis, 285, Case of traumatic strangulated inguinal hernia, 287, Aberrant adrenal growths, 299, Suprapubic partial prostatectomy, 808, Perineal galvanocautery prostatectomy, 809
- C
- Cancer, The Nature and Origin of, Review of Feinberg on, 316
- Carotid artery, internal, Traumatic aneurism of, causing pulsating exophthalmos, 649
- Cervical meninges, Intradural tumor of, Removal, 934
- CHAPMAN, W LOUIS, Postoperative pneumonia, with experiments upon its pathogeny, 700
- CHASE, HENRY MELVILLE, Operation in spinal cord injuries, 495
- Cheek, Epithelioma of, Plastic for repair of defect left by removal of, 812
- Chicago Surgical Society, Transactions of the, 131, 454, 617

Children, Comparative danger of various anæsthetics in, 815
 Cholecystectomy, 240, 271, 279
 Cholecystotomy, 107, 600
 Clavicle, Fracture of, complicated by rupture of axillary artery and of brachial plexus, 1111
 Cleft palate and harelip, 283
 Cleft palate, Result after operation, 1029

COBB, FARRAR, Traumatic asphyxia, 481

COLEY, WILLIAM B, Traumatic hernia, 289, Partial enterocele, 297

Colitis, Chronic ulcerative, treated by appendicostomy, 268

Colon, Multiple papilloma of the, treated by appendicostomy, 269

Common duct stone without characteristic symptoms, 103, with acute septic cholangitis, 104

Costal and thoracic resection for pyothorax, 403

Crile on Blood-pressure in Surgery and the Treatment of Surgical Shock, Review of, 310

CUNNINGHAM, JR, JOHN H, Gastric dilatation and tetany, 527

CURTIS, B FARQUHAR, Operations for hypospadias, 999, Radical cure of femoral hernia, 1015

CUSHING, HARVEY, Intradural tumor of the cervical meninges, 934

D

DA COSTA, Modern Surgery, Review of, 148

DAVIS, GWILYM, G, The treatment of fractures, 778, 818

DAVIS, THOMAS A, Treatment of fractures of the patella, 141

Decapsulation for chronic nephritis, 617

Delamere, Poirier, and Cunéo, The Lymphatics, Review of Leaf's translation of, 1040

Dench's Text-book of Diseases of the Ear, Review of, 636

DOWD, CHARLES N, Partial enterocele, 297, Œsophageal stricture dilated by a thread and a rubber tube, 273, Thrombosis of lateral sinus and upper jugular vein, 276, Tubercular osteomyelitis of the tibia, 277, Harelip and cleft palate, 284, Umbilical hernia, 1005

DUDLEY, E C, Ureterocystostomy for accidental wound of the ureter, 755, 821, appendicitis, Case of, 821

Duodenal ulcer, Perforating, 109

Duodenum, Surgery of the, 302, The treatment of posterior perforations of the fixed portions of the, 727

E

Ear, Diseases of, Review of Dench's Text-book of, 636

EASTMAN, JOSEPH RILUS, Treatment by direct dilatation of cicatricial œsophageal stricture, 161

EISENDRATH, DANIEL N, Conservative surgery in crushing injuries of the arm, 462, Ulcer of leg sequel to thrombophlebitis, 464, Extensive subcutaneous laceration of the abdominal muscles, 979

Elastic ligature of McGraw, Use of, in gastroenterostomy, 144

Electric burn of skull and hands, 434

ELIOT, ELLSWORTH, JR, Gastro-enterostomy, 280, Gastrostomy for stricture of the œsophagus, 296

ELLIOT, JOHN WHELOCK, Report of a case in which two large fibrous concretions were removed from the urinary bladder, 256

Enterocele, partial, 258, 297, Strangulated through obturator foramen, 816

Enterorrhaphy, 282

EDDMANN, JOHN F, Operation for irreducible shoulder dislocation, 591, Gastro-enterostomy, 594, Torsion of the uterus, 817

Ewing on the Clinical Pathology of the Blood, Review of, 155

Exophthalmos, pulsating, The treatment of, 421, 435, Due to traumatic aneurism of the internal carotid artery, 649

Extra-uterine gestation Specimen removed after thirteen years, 464

Eye, Disease of the, Review of Webster Fox on the, 829

F

Face, Gunshot wound of the, 104

Feinberg, Drs Gewebe und die Ursache der Krebsgeschwulste, Review of, 316

Femoral hernia, The radical cure of, 972, 1015

Femur, Spontaneous refracture of a healed fracture, 105

FERGUSON, ALEXANDER HUGH, Decapsulation for chronic nephritis, 621

Fibrinous vesical concretions removed by cystotomy, 256

FINNEY, J M T, Gastric and duodenal surgery, 307

FISK, ARTHUR L, Sarcoma of humerus, 997, Gunshot wound of head of humerus, 1006, Rupture of axillary artery and brachial plexus with fracture of clavicle, 1011

FOX, Webster Treatise and Diseases of the Eye, Review of, 829

Fractures, The Treatment of, 778, 818, Review of Scudder on, 827

FREEMAN, LEONARD, Unilateral hæmaturia from chronic nephritis, Recovery after decapsulation of the kidney, 370

G

GALLAUBLT, BERN B, Tenorrhaphy, 284, Treatment of fracture of the lower jaw, 295, Traumatic pyeloparaneuric cyst, 573, 597, Traumatic herniæ, 597

Gall-bladder and liver, Gunshot wound of the, 100, Chronic empyema of the, 570, Surgery, 600, Gall-stone in common duct, without characteristic symptoms, 103 with acute septic cholangitis, 104

Gangrene of the hollow viscera, Spontaneous, 554

Gastrectomy for cancer of stomach, 997, 999

Gastric and duodenal surgery, 302

Gastric dilatation and tetany, 527

Gastric ulcer, perforating, Contribution to the surgery of, 333

Gastroduodenostomy for benign pyloric obstruction, 995, by Finney's method, 587, Gastro-enterostomy, 593, Present status of the operation of, 512, by the use of the elastic ligature of McGraw, 144, 590, for benign tumor of pylorus, 1009, for cicatricial obstruction of pylorus, 1010, for gastric ulcer, One hundred cases of, 690, for pancreatic carcinoma, 609

Gastrojejunostomy, 279

Gastrostomy for stricture of the œsophagus, 295

Gastrotomy, Osteoplastic, for stricture of the œsophagus, 1000

GIBBON, JOHN H, Three cases of perforated gastric ulcer and one case of perforated duodenal ulcer, 109, Operative treatment of perforated typhoid ulcer, 123, Chronic obstruction of the bowels, 450, Fracture of the patella treated by suture, 1021, Management of premaxillary bone in operations for harelip, 1031

- GORDON, DONALD, JR, Plans of a sanitary animal cage for laboratory use, 991
 GRAY, FRANK D, Revival of suprapubic prostatectomy, 920
 GREENSFELDER, LOUIS A, Xanthoma infantum, 460
 GRIFFITH, FREDERIC, Lip-tie, 433
 Gunshot wound of head of humerus, 1006
 GWYER, FREDERICK, Lymphatic constitution Care of the lymphatics during and after surgical operations, 641, 814
 Gynæcology, Pryor's Text-book of, Review of, 634

H

- Hæmaturia from chronic nephritis, Recovery after decapsulation of the kidney, 370
 HALL, J BASIL, Primary carcinoma of the bulbous urethra, 375
 HALSTEAD, ALBERT EDWARD, Diverticula of the œsophagus, 171, Interscapulothoracic amputation for sarcoma of scapula, 134, 137, Pancreatic cyst, 458
 Harelip and cleft palate, 283
 HARRIS, MALCOLM L, The treatment of penetrating wounds of the stomach, with report of sixteen cases, 356, 469, 473
 HARSHA, WILLIAM M, Effect of X-rays on keloid, 454, Pancreatic cyst, 455, Actinomycosis of jaw, 459
 HARTE, RICHARD H, Intestinal perforation in typhoid fever, 8, Suture of fractured patellæ, 1025, Cleft palate, 1029
 HARTWELL, JOHN A, Rupture of the urethra, 1014, Ureter in inguinal hernia, 1017
 HAUBOLD, HERMAN ARTHUR, Report of a case of resection of the liver for gumma, 240
 HAWLEY, GEORGE W, Primary carcinoma of the prostate, 892
 HAYNES, IRVING S, Cholecystotomy, 107, Acute traumatic strangulated hernia, 596, Cystic kidney, 599, Epithelioma of cheek, Excision and plastic operation, 812, Epithelioma of tongue, 814
 HEARN, W J, Subacute intestinal obstruction, 433
 Hernia, Acute traumatic strangulated, 287, 596, femoral, Radical cure of, 982, 1015, Inguinal containing ureter, 1017, following operation for appendicitis, 128, Large incarcerated, 293, Littre's, 258, 297, Richter's, Case of, 446, 448, obturator, Strangulated partial enterocele, 816, Prevention and cure by the approximation of the abdominal aponeuroses, 245, Strangulated inguinal and properitoneal, 290, strangulated, Intestinal obstruction due to fibrous stricture consequent upon, 733, umbilical, Operation for, 132, 1013, umbilical, Operation for, followed by gangrene of fat of abdominal wall, 606
 HESSERT, WILLIAM, Resection of the knee for tuberculosis, 131, Umbilical hernia, 132 Appendicitis, complicated, 132
 HEWSON, ADDINELL, Perforating gastric ulcer, 116
 Hip-joint abscess, Acute, 292
 HOPKINS, W BARTON, Trephining for Jacksonian epilepsy, 607
 HOTCHKISS, LUCIUS W, Partial enterocele, 258, 297, Rupture of intestine by contusion, 282, Intestinal obstruction following appendicitis operation, 584, Arthrotomy for irreducible subcoracoid dislocation, 591, Strangulated partial enterocele through the obturator foramen, 816

Humerus, Epiphyseal separation at head of the, 291, fractures of the condyles of, Treatment of, 1033, Osteochondroma of, 996

HUTCHINSON, JAMES P, Treatment of perforated typhoid ulcer, 127, Cleft palate operation, 1030

Hydronephrosis due to papilloma of the renal pelvis, 743

Hypernephroma, 468

Hypospadias, Operative relief of, 1007

I

Ileocæcal resection for tuberculosis, 1010

Infectious Diseases, Roger on, Review of, 637

International Clinics, 1903, Review of, 158, Vol iv, Review of, 480

Interscapulothoracic amputation for sarcoma of scapula, 134, Two cases of, 997

Intestinal calculus, 444, 448, obstruction, Subacute, 443, After operation for appendicitis, 584, 592, due to fibrous stricture consequent upon strangulated hernia, 733, perforation in typhoid fever, 8, 118, Rupture of, by contusion, 282

Intussusception in typhoid fever, 604

J

Jacksonian epilepsy, Trephining for, 607

Jay, lower, Necrosis of entire, 130, Splint for fracture of, 294

JOHNSON, ALEXANDER B, Observations on the effects on the skin by the discharge of small-arms loaded with smokeless powder, 798, 1006, Gastro-enterostomy for cicatricial obstruction of pylorus, 1010

JOPSON, JOHN H, Perforating typhoid ulcer in children, 124, Rupture of middle meningeal artery, 452

Jugular vein, Thrombosis of, 276

K

KAMMERER, FREDERICK, Spontaneous refracture of a healed fracture of the femur, 105, Cancer of the pylorus, 106, Gastrostomy for stricture of the œsophagus, 297, Inflammatory tumors of pylorus, 281, Intestinal obstruction after appendicitis operation, 585, Resection of pylorus for benign stenosis, 587, Chronic pancreatitis, 588, Gastroenterostomy, 594, Gastro-enterostomy for benign tumor of pylorus, 1009, Ileocæcal resection for tuberculosis, 1010, Foreign body in larynx, 1020, The radical cure of femoral hernia, 982, 1015

KEEN, WILLIAM W, Rhinophyma, 665, 818, The treatment of fractures, 818

KEENAN, CAMPBELL BROWN, Sarcoma of tongue, 956

Keloid, Effect of X-rays on, 454

Kidney calculi, The Rontgen-ray diagnosis of, 748, Nephrectomy for, 1018, decapsulation of, Effect of, upon hæmaturia from chronic nephritis, 370, Decapsulation of, for Bright's disease, 617, Polycystic, 467, Hypernephroma, 468, Obstructive dilatation of, due to papilloma of the renal pelvis, 743, Traumatic cyst involving, 573, 597, Traumatism of, 597, Cystic, 598

KILIANI, OTTO T G, Electric burn of skull and hands, 434, Foreign body in the bronchial, 1019

Knee, flexure ankylosis, Excision for, 285, Resection of, for tuberculosis, 131

Kocher, Text-Book of Operative Surgery, translated by H J Stiles, Review of, 1042

KOLISCHER, GUSTAV, Vesicovaginal necrosis for intravesical manipulations, 822

Krebsgeschwulste, Das Gewebe und die Ursache der, Review of Feinberg on, 316

L

Larynx, Foreign body in, 1020, malignant disease of, Laryngectomy for, 968

Lateral sinus, Thrombosis of, 276

LE CONTE, ROBERT G, Intestinal perforation in typhoid fever, Operative treatment of, 118, 127, Closure of abdominal wounds, 129, Necrosis of entire lower jaw, 130

LEWIS, MORRIS J, Treatment of perforating gastric ulcer, 115

LILIENTHAL, HOWARD, Gunshot wound of the face, 104, Appendicostomy, 270, Cholecystectomy, 279, Pyloroplasty, 281, Partial enterocele, 298, Aberrant adrenal tumors, 300, Pulsating exophthalmos, 435, Suprapubic prostatectomy followed by formation of vesical calculi, 436, Gastroduodenostomy by Finney's method, 587, Gastro-enterostomy, 595, Cystic kidney, 599, Complete excision of the scapula for sarcoma, 807, Suprapubic prostatectomy, 811

Lip-tie, 433

Liver, Abscess of, 615, Diagnosis of abscess of the, 711, Excision of tuberculous mass from, 98, Operative removal of a gummatous tumor of the, 240

Lung, Removal of a foreign body from, through a bronchoscope, 194

LYDSTON, G FRANK, Case of enormous prostatic calculus, 391

Lymphatic constitution, 641, 814

Lymphatics, Care of, during and after surgical operations, 641, 814, Review of Delamare, Poirier, and Cunéo's Treatise on the, 1040

M

McARTHUR, L L, Pancreatic cyst, 458, Treatment of perforating wounds of the abdomen, 471, Decapsulation for chronic nephritis, 618

McGraw's elastic ligature, Use of, in gastro-enterostomy, 144

McREYNOLDS, R P, Five cases of operations for perforated typhoid ulcer, 125

MACLAREN, ARCHIBALD, Contribution to the surgery of perforating gastric ulcer, 333

MAURY, J W DRAPER, Plans of a sanitary animal cage for laboratory use, 991

MAYO, WILLIAM J, Radical operations for the cure of cancer of the pyloric end of the stomach, 321

Meckel's diverticulum causing obstruction of bowels, 447

MELLISH, ERNEST J, Chronic empyema of the gall-bladder, 570

Meningeal artery, middle, Rupture of branches of, by contrecoup, 451

Mesenteric occlusion, 554

Mesentery, Volvulus of, 1036

MEYER, WILLY, Appendicostomy for colitis, 268, for papilloma of colon, 269, Cholecystectomy, 271, Harelip and cleft palate, 284, Intestinal obstruction after appendicitis operation, 585, Gastro-enterostomy with elastic ligature, 590, 593, 594, Gastroduodenostomy for benign obstruction of pylorus, 995, Gastrectomy for cancer of posterior wall of stomach, 997, Resection of stomach for carcinoma, 999, osteoplastic gastrotomy for stricture of œsophagus, 1000

MIKULICZ, PROFESSOR VON, Gastric and duodenal surgery, 302

- MIXTER, SAMUEL J, Operation in spinal-cord injuries, 495
 Modern Surgery, Review of Da Costa on, 148
 Monprofit, Chirurgie des Ovaire et des Trompes, Review of, 151
 MOORE, JAMES E, Complications and sequels of prostatectomy, 385
 MORGAN, WILLIAM E, Treatment of fractures of the patella, 140
 Morrow on Social Diseases and Marriage, Review of, 639
 MOSCHCOWITZ ALEXIS V, A New osteoplastic amputation at the ankle-joint, 790
 Mount Sinai Hospital Reports, Vol III, Review of, 830
 MOYNIHAN, B G A, Suprapubic prostatectomy, Report of twelve cases, 1, Gastric and duodenal surgery, 304, One hundred cases of gastro-enterostomy for simple ulcer of the stomach and duodenum, 690
 MURPHY, JOHN B, Specimen of extra-uterine gestation removed after thirteen years, 464, The opening of the female bladder for intravesical manipulations, 822
 MURRAY, FRANCIS W, Gastrostomy for œsophageal stricture, 295, The treatment of pulsating exophthalmos, 421, 435

N

- Nephrectomy for stone in kidney, 1018
 Nephritis, chronic, Decapsulation for, 617
 Nervous Diseases, Organic, Review of Starr's Treatise on, 153
 New York Surgical Society, Transactions of the, 100, 268, 284, 434, 584, 596, 807, 995, 997, 1017
 Nose and Throat Work, Review of Richards on, 479

O

- OCHSNER, A J, Interscapulothoracic amputations, 136, Demonstration of the McGraw elastic ligature, 144, 146, Treatment of actinomycosis, 459, Decapsulation for chronic nephritis, 621
 Œsophagus, stricture of, Gastrostomy for, 295, Stricture of, dilated by a thread and a rubber tube, 273, stricture of the, Dilatation of cicatricial, 161, Diverticula of the, 171, Typhoidal stricture of, 683, stricture of, Osteoplastic gastrotomy for, 1000
 Operative Surgery, Review of Bickham's Text-Book of, 824, Review of Kocher's Text-Book of, 1042
 Orthopædic Surgery, Review of Whitman's Treatise on, 476
 Osteitis deformans, 438
 Osteomyelitis, Tubercular, of tibia, 277
 Ovaire et des Trompes, Monprofit, Chirurgie des, Review of, 151
 OWENS, JOHN E, Treatment of perforating wounds of the abdomen, 472

P

- Pancreas, Carcinoma of, 609
 Pancreatitis, Chronic, 588
 PARK, ROSWELL, Spontaneous gangrene of the hollow viscera, 554
 Parotid gland, Tumors of the, 57
 Patella, Fracture of, suture, 1021, pathology and treatment of recent fractures of the, 138
 Patellæ, Congenital dislocation of, 452, ligamentum, Rupture of, 603
 PECK, CHARLES H, Large incarcerated hernia, 293, Splint for fracture of jaw, 294, Partial enterocele, 298, Plastic after removal of epithelioma of cheek, 813, Nephrectomy for renal calculus, 1018

- Philadelphia Academy of Surgery, Transactions of the, 109, 302, 438, 600, 1021
- PLUMMER, S C, Pathology and treatment of recent fractures of the patella, 138, Tumor of the kidney, 469, Treatment of perforating wounds of the abdomen, 472
- Pneumonia, Postoperative, with experiments upon its pathogeny, 700
- Prostate, hypertrophied, Operative treatment of, 833, Primary carcinoma of the, 892
- Prostatectomy, Complications and sequels of, 385, Suprapubic, 808, Revival of, 928, followed by formation of vesical calculi, 436
- Prostatic calculus, Case of enormous, 391
- Prostatotomy, Perineal galvanocautery, 809
- Pryor's Text-Book of Gynæcology, Review of, 634
- Pyeloparanephric cyst, Traumatic, 573, 597
- Pyloric obstruction, benign, Resection of stomach for, 995
- Pyloroplasty, 279
- Pylorus, benign tumor of, Gastroenterostomy for, 1009, cicatricial obstruction of, Gastroenterostomy for, 1010, cancer of, Result after excision, 106, Inflammatory tumors of the, 281, Resection of, for benign stenosis, 587
- Pyothorax, Costal and thoracic resection for, 403
- Q**
- Quadriceps extensor tendon, Suture of divided, 603
- R**
- REED, ROBERT J, Closure of abdominal wounds, 320
- Renal calculi, Nephrectomy for, 1018, The Rontgen-ray diagnosis of, 748
- Renal pelvis, Papilloma of, causing hydronephrosis, 743
- Retrocolic abscess from appendicitis, 102
- REYNOLDS, HARRY B, Papilloma of the renal pelvis with massive hydronephrosis, 743
- Rhinophyma, 665, 818
- RHOADS, THOMAS L, The diagnosis of abscess of the liver, 711
- Richards on Nose and Throat Work for the General Practitioner, Review of, 479
- RIES, EMIL, Decapsulation chronic nephritis, 627
- ROBERG, O THEODORE, Sialolithiasis, 669
- ROBERTS, JOHN B, Osteitis deformans, 438, Intestinal calculus, 448, Treatment of fracture of patella, 1027, Volvulus of mesentery, 1039
- RODMAN, WILLIAM L, Treatment of gastric ulcer, 115, Operative treatment of perforated typhoid ulcer, 125, Hernia after operation for appendicitis, 129, Suture of fractured patellæ, 1025
- Roger on Infectious Diseases, Review of, 637
- ROGERS, JOHN, JR, Pyloroplasty, Gastrojejunostomy, 279, Gastroenterostomy, 596, The present status of the operation of gastroenterostomy, 512
- ROME, ROBERT R, Excision of tuberculous mass from the liver, 98
- ROSS, GEORGE G, Rupture of the ligamentum patellæ, 603, Acute intussusception in typhoid fever, 604, Gangrene of fat of abdominal wall after operation for umbilical hernia, 606, Rupture of

- branches of the middle meningeal artery, 452
- RUGBY, HUGH M., Pulsating exophthalmos due to traumatic aneurism of the internal carotid artery, 649
- S**
- Salivary glands, mixed tumors of the, 57, 207
- Santee, Anatomy of the Brain and the Spinal Cord, Review of, 317
- SARGENT, PERCY W G, Intestinal obstruction due to fibrous stricture consequent upon strangulated hernia, 733
- Scapula, Complete excision of, for sarcoma, 807, sarcoma of, Interscapulothoracic amputation for, 134
- SCHWYZER, ARNOLD On bronchoscopy, with report of a case in which a foreign body was removed from a lung through a bronchoscope, 194
- SCOTT, J ALISON, Diagnosis of gastric ulcer, 116, diagnosis of perforating typhoid ulcer, 122
- Scudder, Charles Locke, The Treatment of Fractures, Review of, 827
- SENN, E J, Treatment of perforating wounds of the abdomen, 469
- Sialolithiasis, 669
- SHELDON, JOHN G, Cirrhosis of the stomach, 341
- Shock, Treatment of Surgical, Review of Crile's Treatise on, 310
- Shoulder dislocation, irreducible, Arthrotomy for 591
- SITER, E HOLLINGSWORTH, Treatment of fractures of the condyles of the humerus, 1033
- Skin, Effects on the, by the discharge of small-arms loaded with smokeless powder, 798, 1006
- Skin-grafting infected areas, 776
- SMITH, JOSEPH F, The Rontgen-ray diagnosis of renal calculus 748
- SMITH, RICHARD R, Injuries to the axillary vessels occurring during operations for carcinoma of the breast, 757
- Smokeless powder, Effects of, on the skin by the discharge of small-arms loaded with, 798, 1006
- Social Diseases and Marriage, Morrow on, Review of, 639
- Southern Surgical and Gynecological Association, Transactions for 1903, Review of, 157
- SPELLISSY, JOSEPH M, Enterolith, 449
- Spina bifida, with anterior opening, 612
- Spinal-cord injuries, Operation in, 495
- Spinal tumor, Removal of intradural, 934
- Starr's Treatise on Organic Nervous Diseases, Review of, 153
- STEELE, D A K, Treatment of fractures of the patella, 139, The McGraw elastic ligature, 144
- STEINBACH, LEWIS W, Cases of cholecystotomy, 600
- STEWART, FRANCIS T, Eight cases of operation for perforated typhoid ulcer, 126, Perforating gastric ulcer, 117, Perforating gunshot wound of the stomach, 117, Excision of condyle of jaw for temporomaxillary ankylosis, 450, Rupture by contrecoup of branches of middle meningeal artery, 451, Congenital dislocation of the patellæ brachydactylia, 452, Suture of divided quadriceps extensor tendon, 603
- STIMSON, L A, Osteochondroma of humerus, 996, Umbilical hernia, 1005
- Stomach, cancer of, Resection for, 997, 999, Cirrhosis of, 341, Dila-

- tation and tetany, 527, Gunshot wound of, 100, 117, 1002, Perforated ulcer of, 109, Perforating ulcer of, Contribution to the surgery of, 333, Radical operations for the cure of cancer of the pyloric end of the, 321, Result after excision of pyloric portion of, for cancer, 106, Surgery of the, 302, ulcer of, One hundred cases of gastro-enterostomy for, 690
- STONE, I S, Perforation of the urinary bladder by an appendiceal abscess, 265
- SUMMERS, JOHN EDWARD, JR, The treatment of posterior perforations of the fixed portions of the duodenum, 727
- Suprapubic cystotomy for removal of prostate, 1, 436, 808, 928
- Surgery, experimental, Animal cage for laboratory use in, 991, Operative, Review of Kocher's Text-Book of, translated by H J Stiles, 1042, Practical, Review of Bergmann, Bruns, and Mikulicz's System of, Translation, edited by W T Bull, Vol I, 1041, Principles and Practice of, Review of Vaughan on, 315
- SYMS, PARKER, Cystic kidney, 598
- T**
- TAYLOR, WILLIAM J, Operative treatment of perforated typhoid ulcer, 124, Hernia following operations for appendicitis, 128, Leontiasis ossium, 443, Late results from fracture of patella, 1027
- Temporomaxillary ankylosis, Excision of condyles of jaw for, 450
- Tenorrhaphy, 284
- TERRY, WALLACE I, Malignant disease of the larynx, Total laryngectomy, 968
- THOMPSON, JAMES E, Stricture of the œsophagus due to typhoidal ulceration, 683
- Tetany of stomach, 527
- Thoracic resection for pyothorax, 403
- Tongue, Epithelioma of, 814, Sarcoma of, 956
- TOWNSEND, W R, Excision of knee for flexure ankylosis, 285
- Trephining for Jacksonian epilepsy, 607
- Tuberculosis of knee treated by resection, 131, of liver, Excision of, 98, of ileocœcal region, Resection of, 1010, of tibia, 277
- Tunica vaginalis, Fibromata of the, 396
- Tuttle on Diseases of Anus, Rectum, and Pelvic Colon, Review of, 631
- Typhoid fever, Intestinal perforation in, 8, 118, complicated by intussusception, 604
- Typhoid ulceration of œsophagus causing stricture 683
- U**
- Umbilical hernia, Operation for, 132, 1003
- Ureter, Accidental wound of, treated by ureterocystostomy, 755, 821, in inguinal hernia, 1017
- Urethra, Primary carcinoma of the bulbous, 375, Rupture of the, 1014
- Uterus, Torsion of the, 817
- V**
- VANDERVEER, ALBERT, Gastric and duodenal surgery, 306
- Vaughan on The Principles and Practice of Surgery, Review of, 315
- Volvulus of entire mesentery, 1036

W

- WALKER, JOHN B, Partial enterocoele, 298
- WATSON, FRANCIS S, The operative treatment of the hypertrophied prostate, 833
- WHARTON, HENRY R, Osteitis deformans, 443, Control of hemorrhage from branches of middle meningeal artery, 452, Operative treatment of cleft palate, 1031
- WHITING, A D, Volvulus of the entire mesentery, 1036
- WHITMAN, ROYAL, Treatment of flexure ankylosis of knee, 287, Acute abscess of hip-joint, 292, Treatise on Orthopædic Surgery, Review of, 476
- WILCOX, SIDNEY F, Skin-grafting infected areas, 776
- WILLARD, DE FOREST, Pathology of osteitis deformans, 442, Gastro-enterostomy for pancreatic carcinoma, 609, Spina bifida, with anterior opening, 612, Liver abscess, 615

- WINSLOW, KENNEDY M, Approximation of the aponeuroses of the abdominal wall for the prevention and cure of hernia, 245
- WOOD, FRANCIS CARTER, The mixed tumors of the salivary glands, 57, 207
- WOOLSEY, GEORGE, Cholecystectomy, 272, Operations for harelip and cleft palate, 283, Sarcoma about humerus, 997, Interscapulothoracic amputation, Two cases, 997, Ventral hernia, 1005, Operation for hypospadias, 1008, Rupture of brachial plexus, 1013

X

- Xanthoma infantum, 460
- X-ray diagnosis of renal calculi, 748

Y

- YOUNG, JAMES K, Operations for cleft palate, 1030, Apparatus for determining asymmetry of the lower extremities, 1032

